High Output Current, Rail-to-Rail Input/Output
Dual CMOS Operational Amplifier

■GENERAL DESCRIPTION

The NJU7043 is a Rail-to-Rail Input/Output dual CMOS operational amplifier with a low operating voltage from 1.8V to 5.5V and high output current of 40mA which is higher than our conventional CMOS operational amplifiers.

It also offers a rail-to-rail input/output between both rails, low operating current of 300μA per amplifier, low input bias current of 1pA and ground sensing, which is suitable for various applications. The NJU7043 is available in 8-lead package of DIP8, 8-lead small surface mount packages of DMP8, SOP8 JEDEC 150mil, SSOP8, MSOP8 (TVSP8) and PCSP20−CC.

■FEATURES

- Operating Voltage V_{DD}=1.8 to 5.5V
- Rail-to-Rail Input/Output
- High Output Current 40mA typ. (at Vo=0V)
- Input Offset Voltage V_{IO}=10mV max.
- Wide Input Common Mode Voltage Range V_{SS} to V_{DD}
- Operating Current I_{DD}=300μA typ. (per Amplifier)
- High Input Impedance 1TΩ typ.
- Low Input Bias Current I_{IB}=1pA typ.
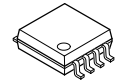- Ground Sensing
- Package DIP8,DMP8,SOP8 JEDEC 150mil , SSOP8 MSOP8 (TVSP8)MEET JEDEC MO-187-DA / THIN TYPE, PCSP20−CC

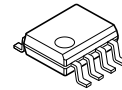## ■PACKAGE OUTLINE
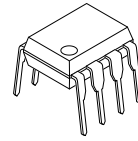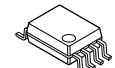

NJU7043D (DIP8)
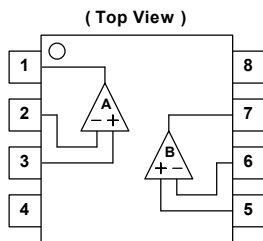
NJU7043M (DMP8)

NJU7043E (SOP8)

NJU7043V (SSOP8)

NJU7043RB1 (MSOP8(TVSP8))

NJU7043SCC (PCSP20−CC)

■PIN CONFIGURATION

○NJU7043D,M,E,V,RB1

(Top View)

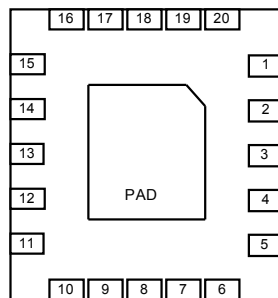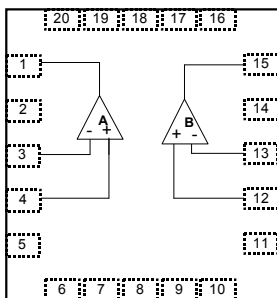**PIN FUNCTION**
1. OUTPUT A
2. −INPUT A
3. +INPUT A
4. $V_{SS}(V^-)$
5. +INPUT B
6. −INPUT B
7. OUTPUT B
8. $V_{DD}(V^+)$

○NJU7043SCC

(Top View)

(Bottom View)

PIN FUNCTION

1. OUTPUT A	11. NC
2. NC	12. +INPUT B
3. −INPUT A	13. −INPUT B
4. +INPUT A	14. NC
5. NC	15. OUTPUT B
6. NC	16. NC
7. NC	17. NC
8. V_{SS} (V⁻)	18. $V_{DD}(V^+)$
9. NC	19. NC
10. NC	20. NC

(Note 1) The NC pin and the PAD should connect with a VSS terminal.

(Note 2) The NC pin is electrically not connected to the die in a package.

(Note 3) The PAD is electrically not connected to the backside of the die. The PAD cannot be used as VSS pin.

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■ABSOLUTE MAXIMUM RATINGS   (Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V_{DD}	7	V
Common Mode Input Voltage Range	V_{ICM}	0 to 7 (Note4)	V
Differential Input Voltage Range	V_{ID}	±7	V
Power Dissipation	P_D	500 (DIP8) 300 (DMP8) 300 (SOP8) 250 (SSOP8) 320 (MSOP8 (TVSP8)) 400 (PCSP20−CC)(note 6)	mW
Operating Temperature Range	Topr	-40 ~ +85	°C
Storage Temperature Range	Tstg	-55 ~ +125	°C

(Note 4) When supply voltage is less than 7V, the absolute maximum input voltage is equal to the voltage.

(Note 5) Decoupling capacitor should be connected between V_{DD} and V_{SS} due to the stabilized operation for the circuit.

(Note 6) On the PCB " EIA/JEDEC (76.2x114.3x1.6mm, two layers, FR-4) ".

(Note 7) Do not exceed "Power dissipation: P_D" in which power dissipation in IC is shown by the absolute maximum rating.

Refer to following Figure 1 for a permissible loss when ambient temperature (Ta) is Ta≥25°C.

Figure1. Power Dissipation vs. Temperature
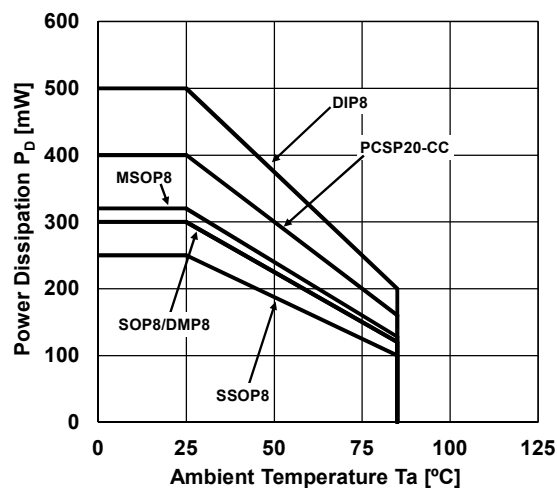
■RECOMMENDED OPERATION CONDITION   (Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V_{DD}	1.8 ~ 5.5	V

■ELECTRICAL CHARACTERISTICS

● DC CHARACTERISTICS (V_{DD}=3.0V, Ta=25°C)

PARAMETER	SYMBOL	RATING	MIN	TYP	MAX	UNIT
Operating Current	I_{DD}	No Signal, Dual Circuits	-	600	1,000	μA
Input Offset Voltage	V_{IO}		-	-	10	mV
Input Bias Current	I_B		-	1	-	pA
Input Offset Current	I_{IO}		-	1	-	pA
Voltage Gain	A_V	R_L=10kΩ	70	90	-	dB
Common Mode Rejection Ratio	CMR	0≤ V_{CM} ≤1.5V, 1.5 ≤V_{CM} ≤3.0V (note7)	42	60	-	dB
Supply Voltage Rejection Ratio	SVR	2.0V ≤ V_{DD} ≤ 5.0V , V_{CM} = V_{DD} / 2	61	80	-	dB
H Level Output Voltage 1	V_{OH1}	R_L=10kΩ	2.95	-	-	V
L Level Output Voltage 1	V_{OL1}	R_L=10kΩ	-	-	0.05	V
H Level Output Voltage 2	V_{OH2}	R_L=600Ω	2.90	-	-	V
L Level Output Voltage 2	V_{OL2}	R_L=600Ω	-	-	0.10	V
Input Common Mode Voltage Range	V_{ICM}	CMR≥45dB	0	-	3	V

(Note 8)　CMR is represented by either CMR+ or CMR- which has lower value.
CMR+ is measured with 1.5V≤V_{CM}≤3V and CMR- is measured with 0V≤V_{CM}≤1.5V.

● AC CHARACTERISTICS (V_{DD}=3.0V, Ta=25°C)

PARAMETER	SYMBOL	RATING	MIN	TYP	MAX	UNIT
Unity Gain Bandwidth	GB	R_L=10kΩ	-	0.8	-	MHz
Total Harmonic Distortion	THD	f=1kHz , Vin=1Vpp , A_v=0dB	-	0.05	-	%
Equivalent Input Noise Voltage	e_n	f=1kHz	-	40	-	nV/√Hz

● TRANSIENT CHARACTERISTICS (V_{DD}=3.0V, Ta=25°C)

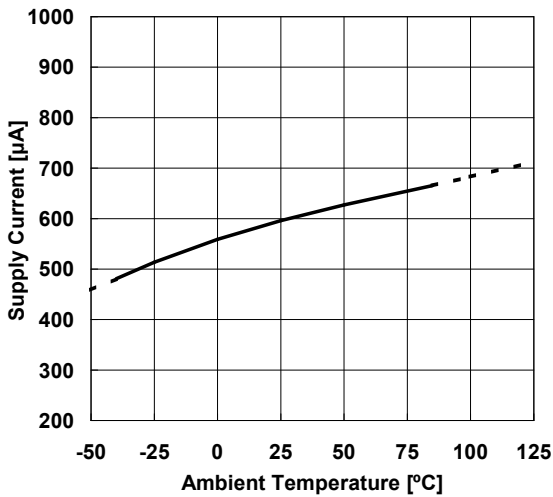| PARAMETER	SYMBOL	RATING	MIN	TYP	MAX	UNIT
Slew Rate	SR	R_L=10 kΩ	-	0.7	-	V/μs

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■TYPICAL CHARACTERISTICS

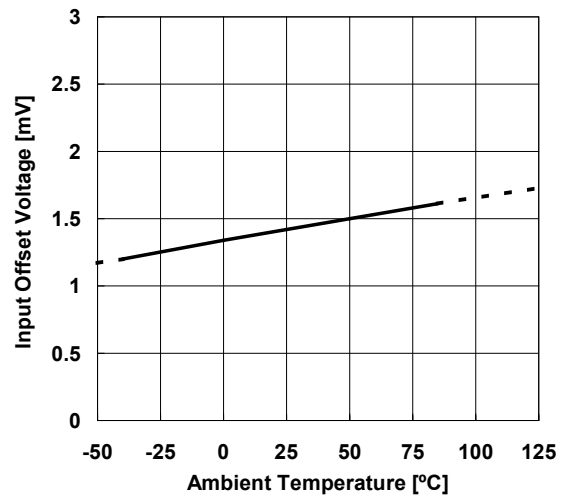**Supply Current vs. Supply Voltage**
Gv = 0dB, Ta=25ºC
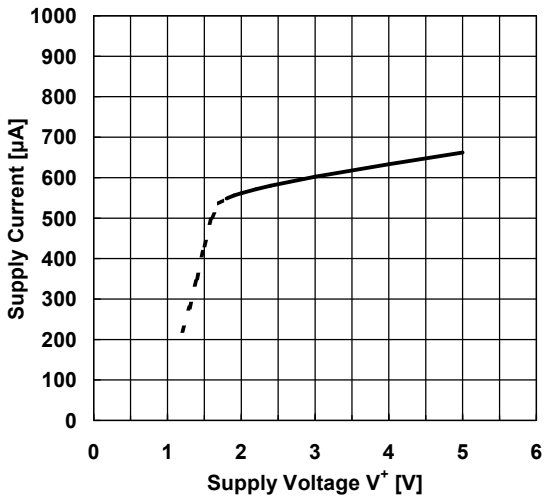
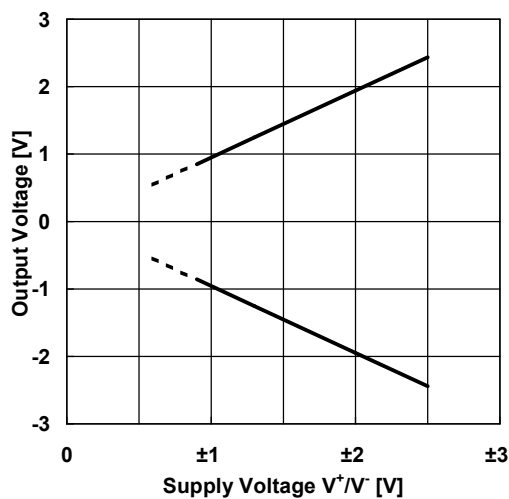**Supply Current vs. Supply Voltge**
(Ambient Temperature)
Gv = 0dB
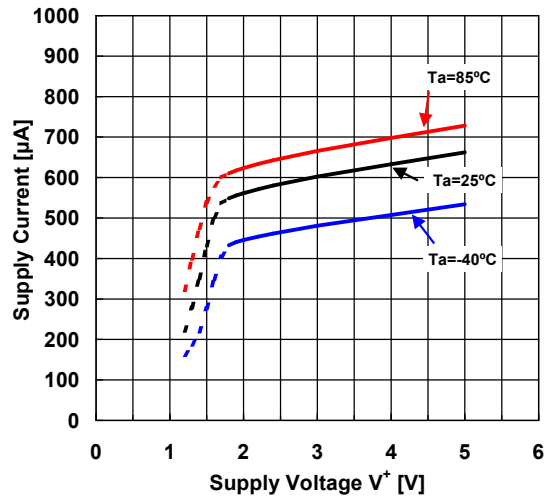
Supply Voltage vs. Ambient Temperature
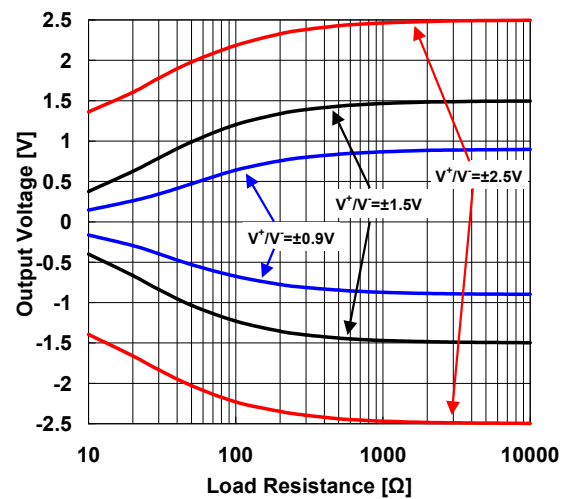V⁺/V⁻=±1.5V Gv = 0dB

Input Offset Voltage vs. Ambient Temperature
V⁺/V⁻=±1.5V

Output Voltage vs. Supply Voltage
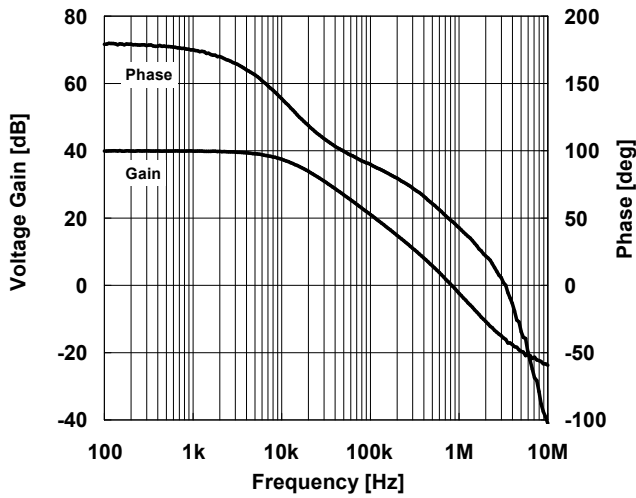Gv = OPEN R_L=600Ω Ta=25ºC

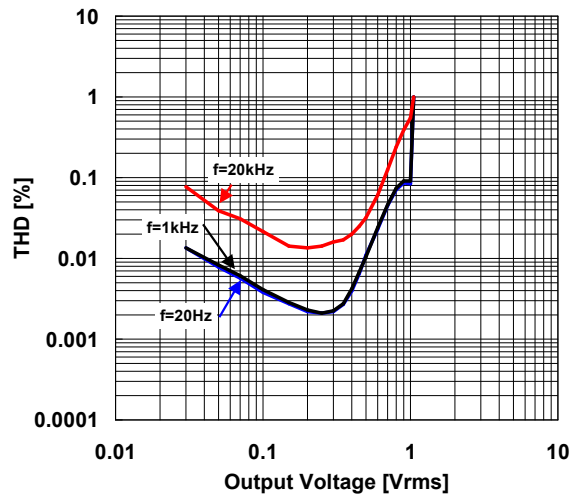**Output Voltage vs. Load Resistance** (Supply Voltage)
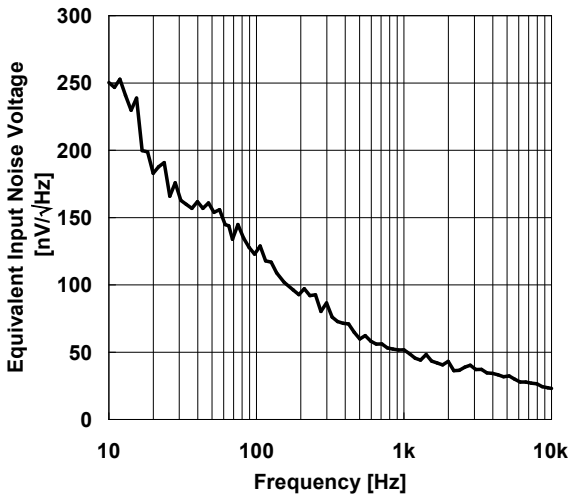Gv = OPEN Ta=25ºC

■TYPICAL CHARACTERISTICS

Gain/Phase vs. Frequency
V⁺/V⁻=±1.5V, Gv=40dB, R_F=100k, Rg=1k, C_L=0

THD vs. Output Voltage
V⁺/V⁻=±1.5V, Gv=0dB, R_L=10k, Ta=25ºC

Equivalent Input Noise Voltage vs. Frequency
V⁺/V⁻=±1.5V, Gv=40dB, Rs=600, R_G=100, R_F=10k, Ta=25ºC

Noise Voltage vs. Source Resistance
V⁺/V⁻=±1.5V, Gv=40dB, R_G=100, R_F=1k, Ta=25ºC
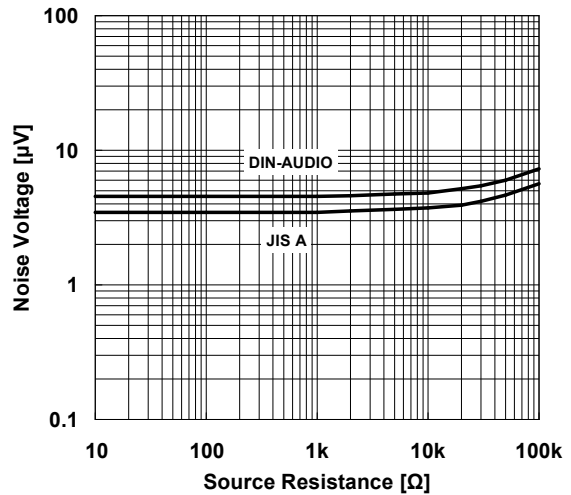
Pulse Response
V⁺/V⁻=±1.5V, V_IN=3Vp-p, f=10kHz
Gv=0dB, Rs=50, R_L=10k, C_L=0F, Ta=25ºC
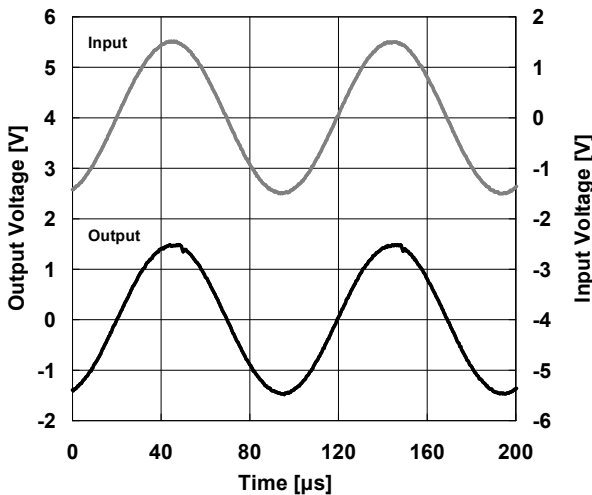
Pulse Response
V⁺/V⁻=±1.5V, V_IN=1Vp-p, f=10kHz
Gv=0dB, Rs=50, R_L=10k, C_L=0F, Ta=25ºC

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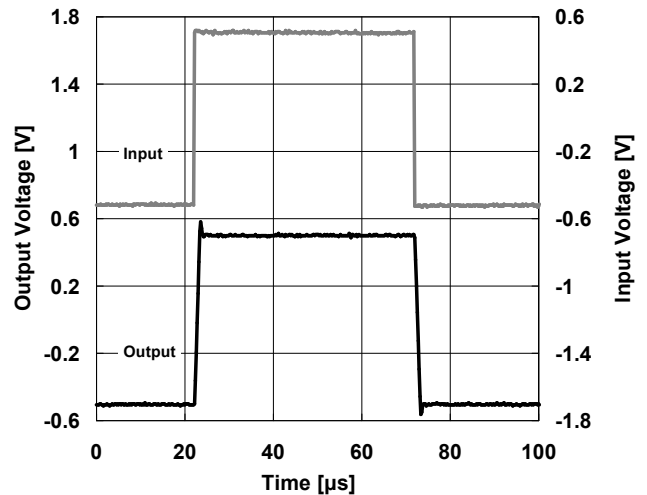
■TYPICAL CHARACTERISTICS

Pulse Response (Rise)
V+/V−=±1.5V, VIN=1Vp-p, f=10kHz
Gv=0dB, Rs=50, RL=10k, CL=0F, Ta=25ºC
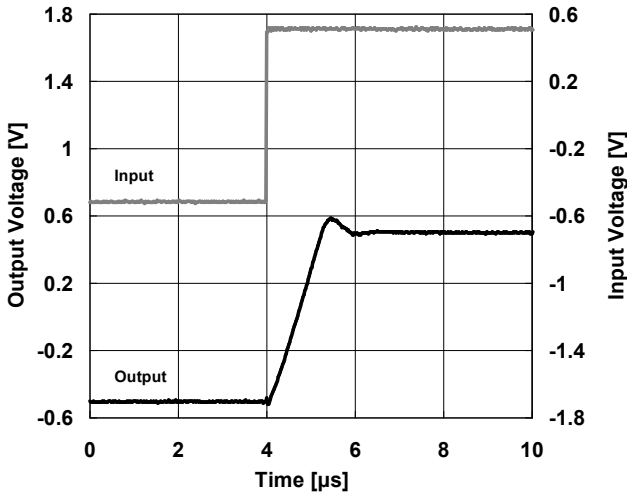
Pulse Response (Fall)
V+/V−=±1.5V, VIN=1Vp-p, f=10kHz
Gv=0dB, Rs=50, RL=10k, CL=0F, Ta=25ºC
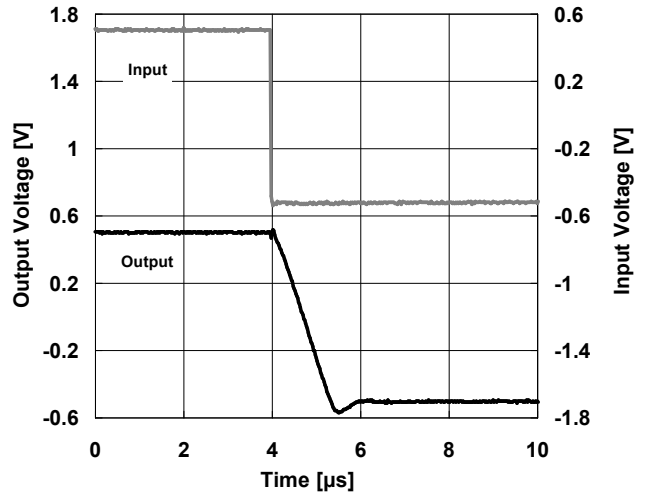
V.F.Peak vs. Frequency (Load Capacitance)
V+/V−=±1.5V, VIN=-20dBm, Gv=0dB, RL=10k, Ta=25ºC
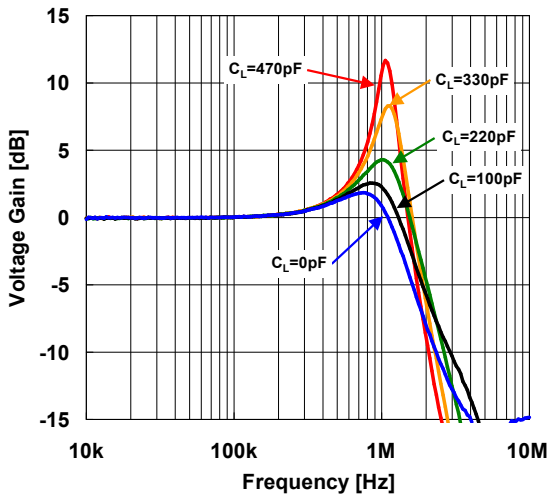
V.F.Peak vs. Frequency (Load Capacitance)
V+/V−=±1.5V, VIN=-20dBm, Gv=0dB, RL=600, Ta=25ºC
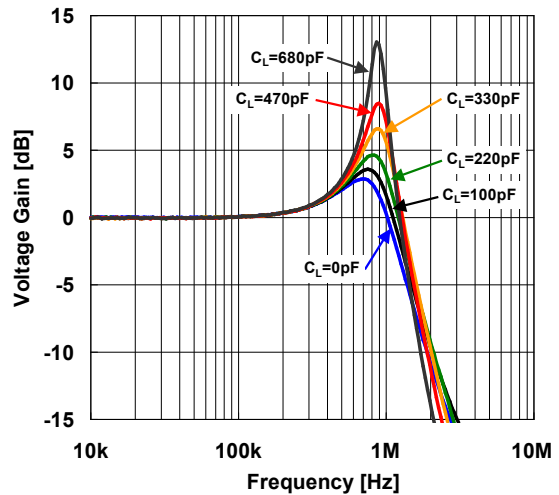
Phase Margin vs. Load Capacitance
V+/V−=±1.5V, VIN=-30dBm, Gv=40dB,
RL=10k, Rs=50, Rg=1k, RF=100k, Ta=25ºC

Phase Margin vs. Load Capacitance
V+/V−=±1.5V, VIN=-30dBm, Gv=40dB,
RL=600, Rs=50, Rg=1k, RF=100k, Ta=25ºC

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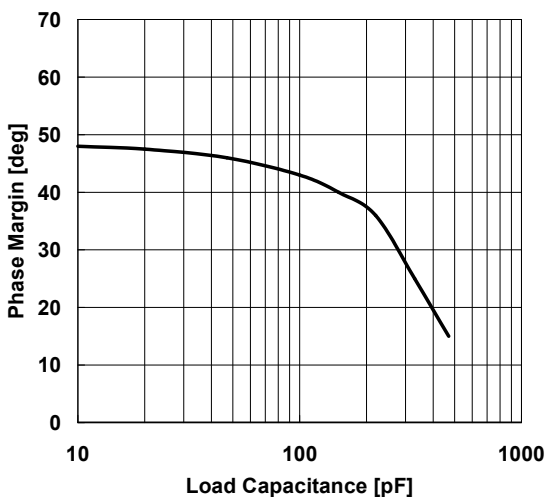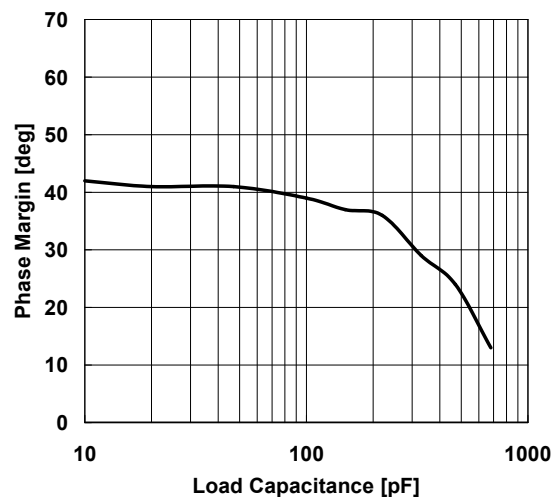
■TYPICAL CHARACTERISTICS

Gain Bandwidth Product vs. Load Capacitance
V⁺/V⁻=±1.5V, V_IN=-30dBm, Gv=40dB,
R_L=10k, Rs=50, Rg=1k, R_F=100k, Ta=25°C
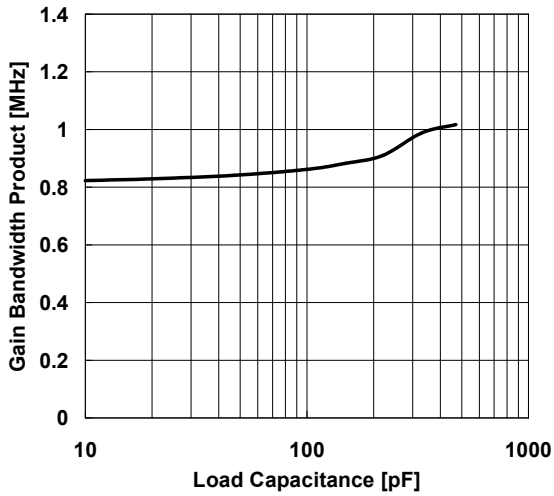
Gain Bandwidth Product vs. Load Capacitance
V⁺/V⁻=±1.5V, V_IN=-30dBm, Gv=40dB,
R_L=600, Rs=50, Rg=1k, R_F=100k, Ta=25°C
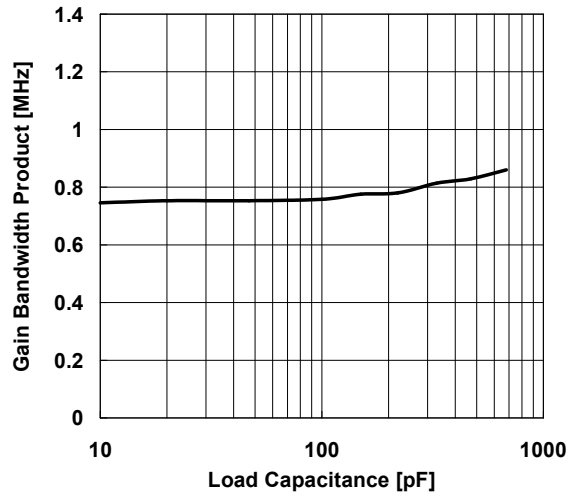
Overshoot vs. Load Capacitance
V⁺/V⁻=±1.5V, V_IN=1Vp-p, f=10kHz
Gv=0dB, R_L=10k, Rs=50, Ta=25°C
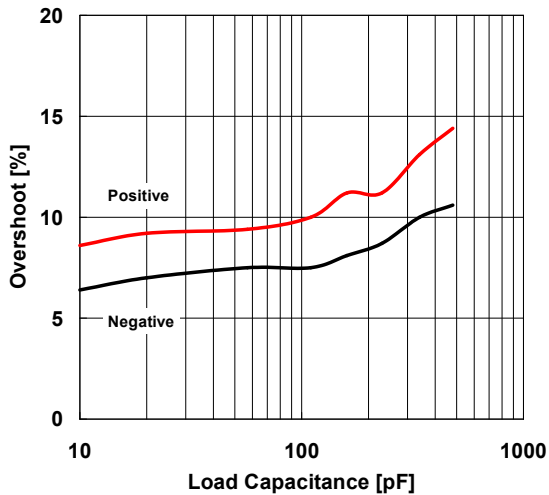
Overshoot vs. Load Capacitance
V⁺/V⁻=±1.5V, V_IN=1Vp-p, f=10kHz
Gv=0dB, R_L=600, Rs=50, Ta=25°C

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