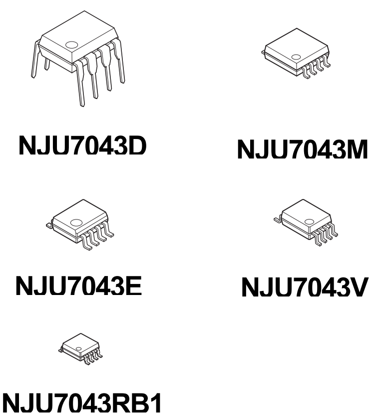
# High Output Current, Rail-to-Rail Input/Output Dual CMOS Operational Amplifier

## ■GNERAL DESCRIPTION

The NJU7043 is a Rail-to-Rail Input/Output dual CMOS operational amplifier.

Based on C-MOS technology, there are excellent features such as high output current, low current consumption, low operating voltage, and very high input impedance.

## ■PACKAGE OUTLINE

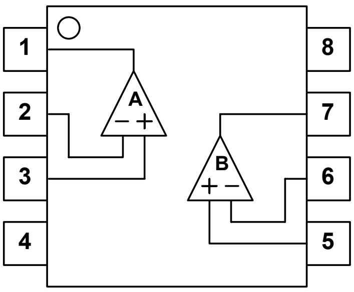



## ■FEATURES

| | | |
|---|---|---|
| ● 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 | NJU7043D | DIP8 |
| | NJU7043M | DMP8 |
| | NJU7043E | EMP8 |
| | NJU7043V | SSOP8 |
| | NJU7043RB1 | TVSP8 |

## ■PIN CONFIGURATION

( Top View )




**PIN FUNCTION**

1. OUTPUT A
2. −INPUT A
3. +INPUT A
4. $V_{SS}$
5. +INPUT B
6. −INPUT B
7. OUTPUT B
8. $V_{DD}$

## ■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 (Note1) | V |
| Differential Input Voltage Range | $V_{ID}$ | ±7 | V |
| Power Dissipation | $P_D$ | 500 (DIP8)<br>300 (DMP8)<br>300 (EMP8)<br>250 (SSOP8)<br>320 (TVSP8) | mW |
| Operating Temperature Range | Topr | -40 ~ +85 | °C |
| Storage Temperature Range | Tstg | -55 ~ +125 | °C |

(Note1) When supply voltage is less than 7V, the absolute maximum input voltage is equal to the voltage.

(Note2) Decoupling capacitor should be connected between $V_{DD}$ and $V_{SS}$ due to the stabilized operation for the circuit.

## ■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,<br>1.5 ≤$V_{CM}$ ≤3.0V (note3 ) | 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 |

(Note3) 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)

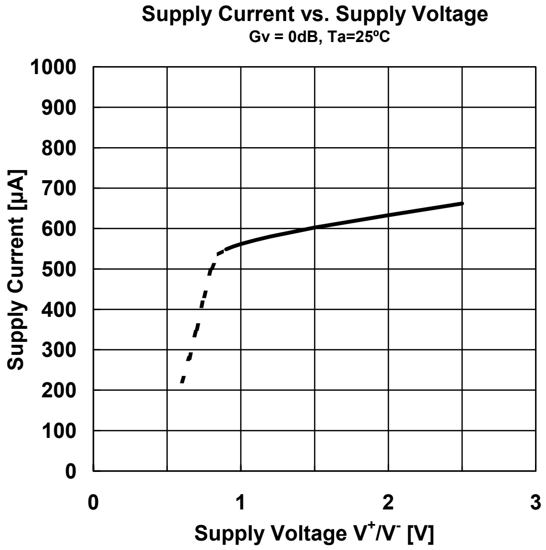
| PARAMETER | SYMBOL | RATING | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Unity Gain Bandwidth | GB | $R_L$=10kΩ | - | 0.8 | - | MHz |
| Total Harmonic Distortion | THD | f=1kHz , Vin=1Vpp , $A_V$=0dB | - | 0.05 | - | % |
| Equivalent Input Noise Voltage | $e_n$ | f=1kHz | - | 40 | - |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

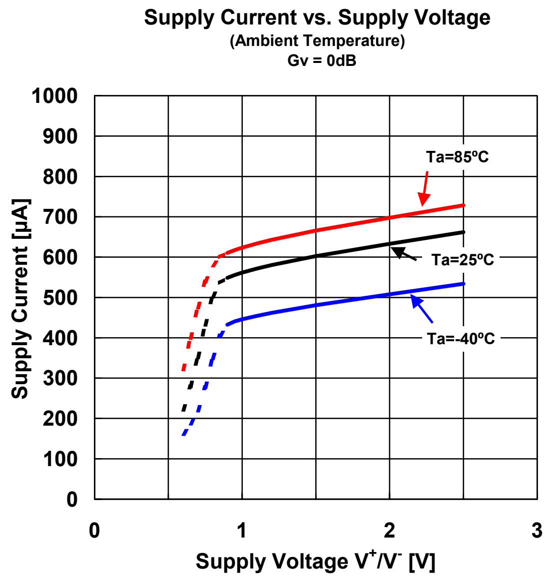
### ● TRANSIENT CHARACTERISTICS

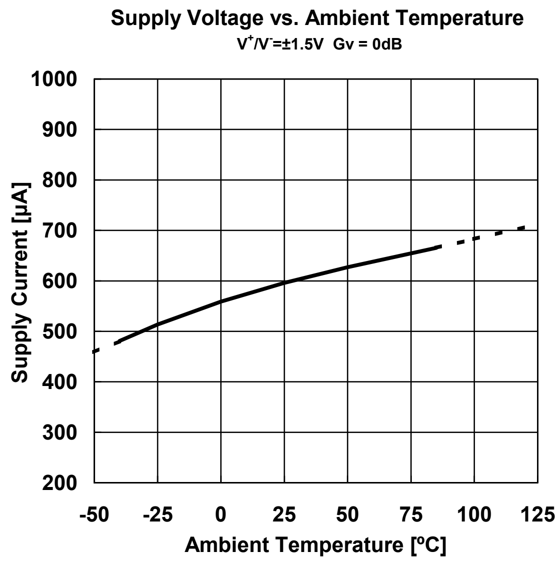
($V_{DD}$=3.0V, Ta=25°C)

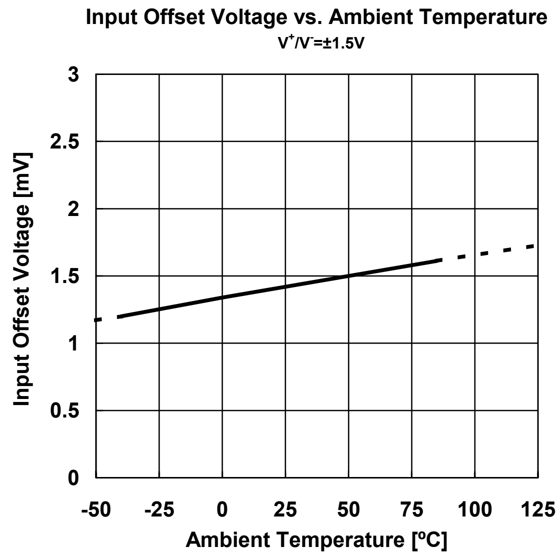
| PARAMETER | SYMBOL | RATING | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Slew Rate | SR | $R_L$=10 kΩ | - | 0.7 | - | V/µs |

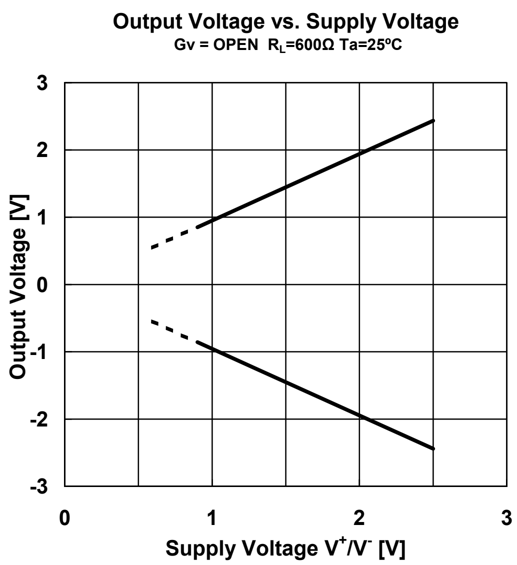
■TYPICAL CHARACTERISTICS

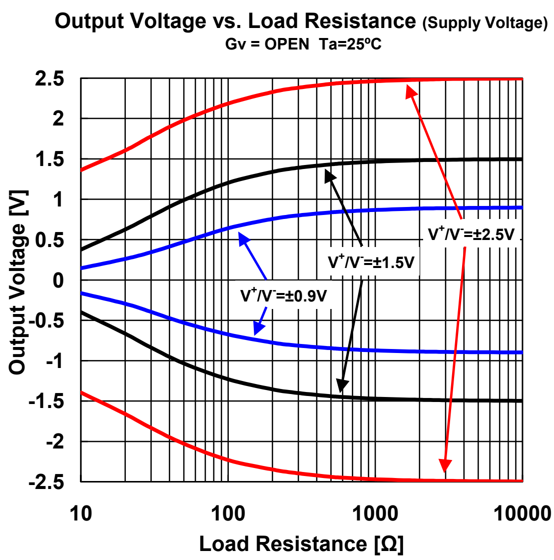


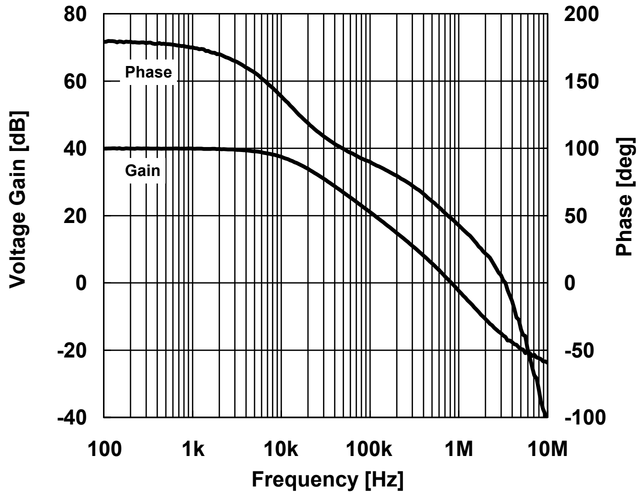



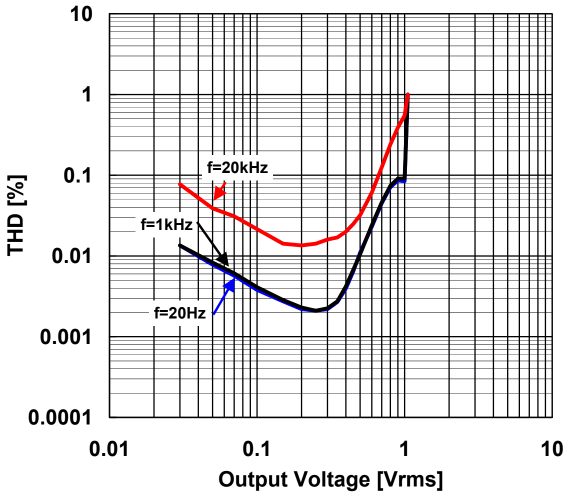



## ■TYPICAL CHARACTERISTICS

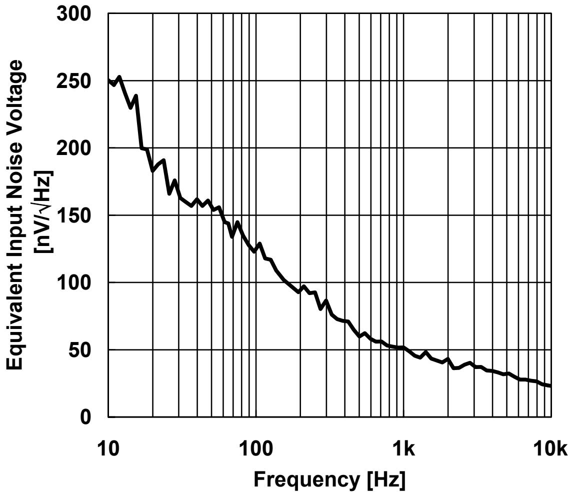
**Gain/Phase vs. Frequency**
$V^+/V^-$=±1.5V, Gv=40dB, $R_F$=100k, Rg=1k, $C_L$=0



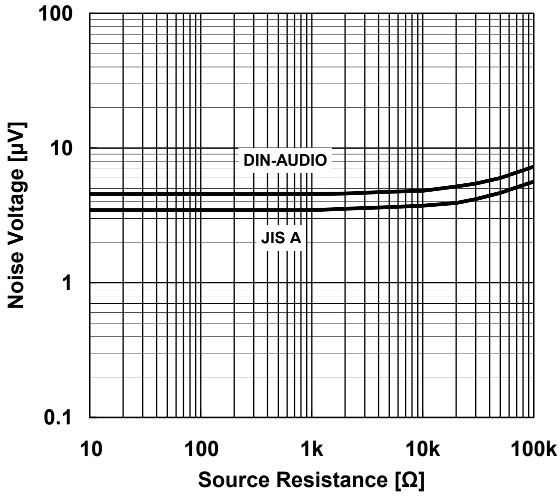

**THD vs. Output Voltage**
$V^+/V^-$=±1.5V, Gv=0dB, $R_L$=10k, Ta=25ºC



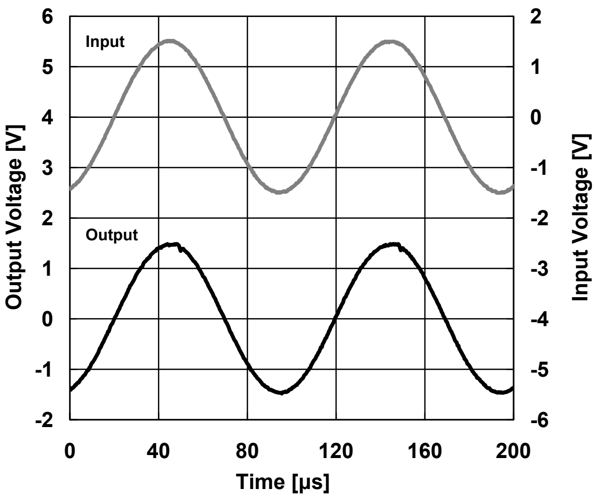

**Equivalent Input Noise Voltage vs. Frequency**
$V^+/V^-$=±1.5V, Gv=40dB, Rs=600, $R_G$=100, $R_F$=10k, Ta=25ºC



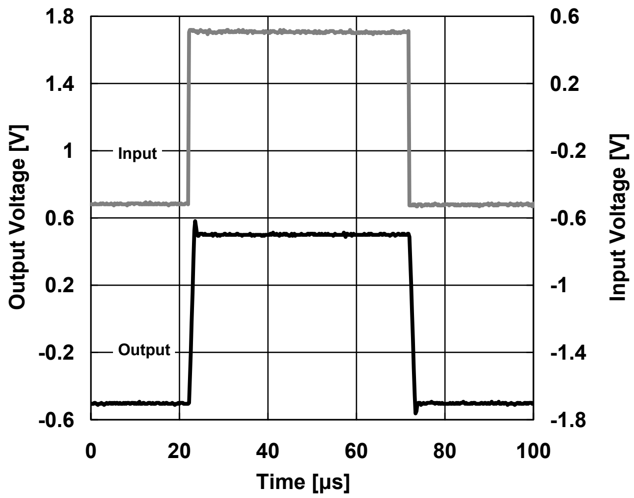

**Noise Voltage vs. Source Resistance**
$V^+/V^-$=±1.5V, Gv=40dB, $R_G$=100, $R_F$=1k, Ta=25ºC




**Pulse Response**
$V^+/V^-$=±1.5V, $V_{IN}$=3Vp-p, f=10kHz
Gv=0dB, Rs=50, $R_L$=10k, $C_L$=0F, Ta=25ºC

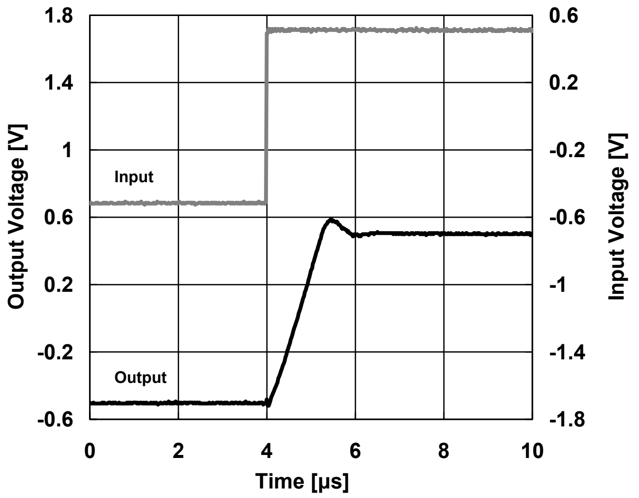



**Pulse Response**
$V^+/V^-$=±1.5V, $V_{IN}$=1Vp-p, f=10kHz
Gv=0dB, Rs=50, $R_L$=10k, $C_L$=0F, Ta=25ºC

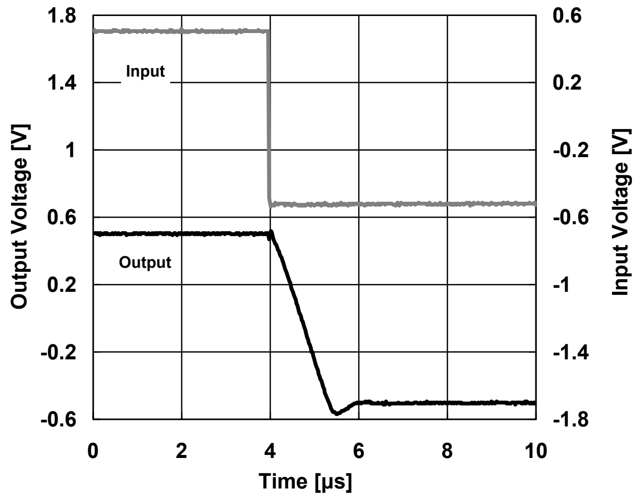


■TYPICAL CHARACTERISTICS

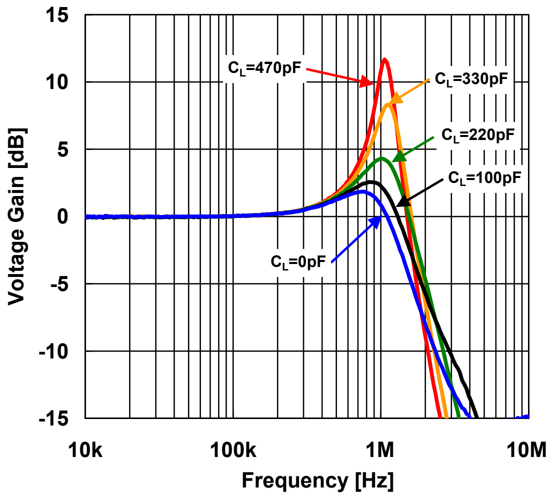
**Pulse Response** (Rise)
$V^+/V^-$=±1.5V, $V_{IN}$=1Vp-p, f=10kHz
Gv=0dB, Rs=50, $R_L$=10k, $C_L$=0F, Ta=25ºC



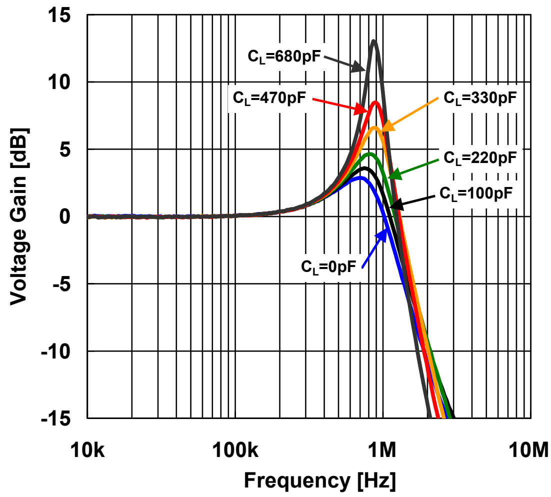

**Pulse Response** (Fall)
$V^+/V^-$=±1.5V, $V_{IN}$=1Vp-p, f=10kHz
Gv=0dB, Rs=50, $R_L$=10k, $C_L$=0F, Ta=25ºC



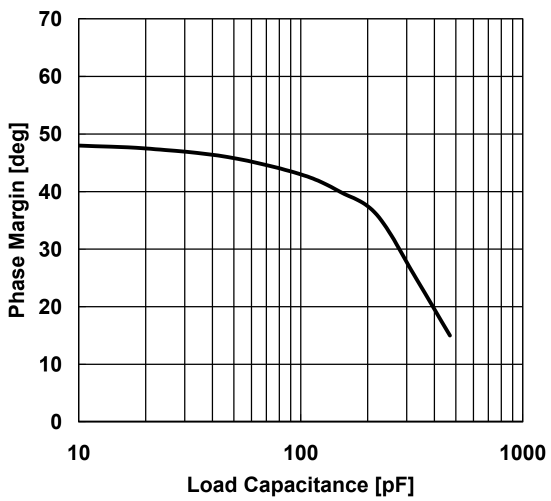

**V.F.Peak vs. Frequency** (Load Capacitance)
$V^+/V^-$=±1.5V, $V_{IN}$=-20dBm, Gv=0dB, $R_L$=10k, Ta=25ºC



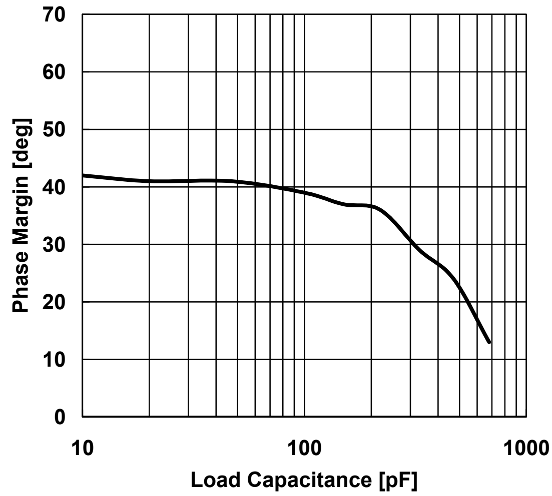

**V.F.Peak vs. Frequency** (Load Capacitance)
$V^+/V^-$=±1.5V, $V_{IN}$=-20dBm, Gv=0dB, $R_L$=600, Ta=25ºC




**Phase Margin vs. Load Capacitance**
$V^+/V^-$=±1.5V, $V_{IN}$=-30dBm, Gv=40dB,
$R_L$=10k, Rs=50, Rg=1k, $R_F$=100k, Ta=25ºC




**Phase Margin vs. Load Capacitance**
$V^+/V^-$=±1.5V, $V_{IN}$=-30dBm, Gv=40dB,
$R_L$=600, Rs=50, Rg=1k, RF=100k, Ta=25ºC



## ■TYPICAL CHARACTERISTICS