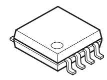
ULTRA HIGH-SPEED SINGLE OPERATIONAL AMPLIFIER

■ GENERAL DESCRIPTION

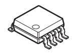
The NJM2712 is a dual high speed wide bandwidth operational amplifier. It features high slew rate of 260V/uS and wide gain band wirth of 1GHz. It is suitable for analog front end application.

■ PACKAGR OUTLINE



NJM2712M

(DMP8)



NJM2712RB1

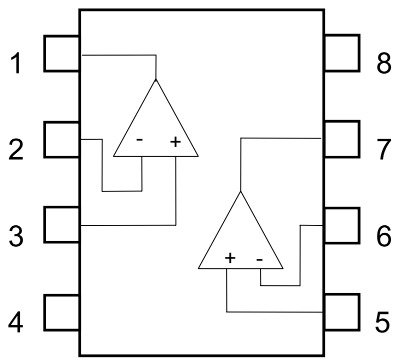
(MSOP8 (TVSP8))

■ FEATURES

• Operating Voltage	±2.0 to ±4.5V
• Operating Current	3.8mA typ. (at V^+/V^-=±2.5V)
• High Slew Rate	260V/µs typ.
• Gain Bandwidth Product	1GHz typ.
Bandwidth	10MHz typ. (at 40dB)
• Unity Gain Bandwidth	180MHz typ.
• Input Offset Voltage	7mV max.
• Maximum Output Voltage	±1.5V typ. (at R_L=1kΩ)
• Supply Voltage Rejection	60dB typ
• Open Loop Voltage Gain	75dB typ.
• Bipolar Technology	
• Package Outline	DMP8, MSOP8 (TVSP8)MEET JEDEC MO-187-DA / THIN TYPE

■ PIN CONFIGURATION

NJM2712M
NJM2712RB1
(Top View)



PIN FUNCTION

1.OUTPUT1
2.-INPUT1
3.+INPUT1
4.V^-
5.+INPUT2
6.-INPUT2
7.OUTPUT2
8.V^+

■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+	10	V
Differential Input Voltage	V_{ID}	±2	V
Power Dissipation	P_D	300(DMP8) 320(MSOP8(TVSP8))	mW
Operating Temperature Range	Topr	-40 to +85	°C
Storage Temperature Range	Tstg	-50 to +150	°C

■RECOMMENDED OPERATING CONDITION

(Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Operating Voltage Range	V^+/V^-		±2.0	±2.5	±4.5	V

■ DC CHARACTERISTICS

(V^+/V^-=±2.5V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Operating Current	I_{CC}	No Signal	-	3.8	6.8	mA
Input Offset Voltage	V_{IO}		-	2.0	7.0	mV
Input Bias Current	I_B		-	2	7	μA
Input Offset Current	I_{IO}		-	350	900	nA
Open Loop Voltage Gain	Av	R_L=2kΩ	65	75	-	dB
Input Common Mode Voltage Range	V_{ICM}		±1.3	±1.5	-	V
Common Mode Rejection	CMR	-1V≤V_{CM}≤+1V	50	60	-	dB
Supply Voltage Rejection	+SVR	2.5V≤V^+≤5V, R_L=2kΩ	50	60	-	dB
	-SVR	-5V≤V^-≤-2.5V, R_L=2kΩ	50	60	-	dB
Maximum Output Voltage	V_{OM}	R_L=1kΩ	±1.2	±1.5	-	V

■ AC CHARACTERISTICS

(V^+/V^-=±2.5V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Bandwidth	BW	Av=40dB,R_f=1.98kΩ ,R_L=∞ C_L=10pF	-	10	-	MHz
Unity Gain Bandwidth	f_T	Av=40dB,Rg=20Ω,R_f=1.98kΩ R_L=∞,C_L=10pF	-	180	-	MHz
Phase Margin	ϕ_M	Av=40dB,Rg=20Ω,R_f=1.98kΩ R_L=∞,C_L=10pF	-	38	-	deg
Equivalent Input Noise Voltage	V_{NI}		-	6.8	-	nV/√Hz

■ TRANSIENT CHARACTERISTICS

(V^+/V^-=±2.5V, Ta=25°C)

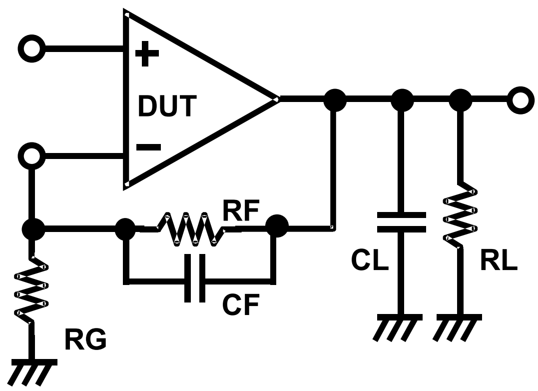
PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Slew Rate	+SR	Av=6dB,R_f=1kΩ,Rg=1kΩ R_L=∞,CL=10pF	-	260	-	V/μs
	-SR		-	260	-	V/μs

■ Note:

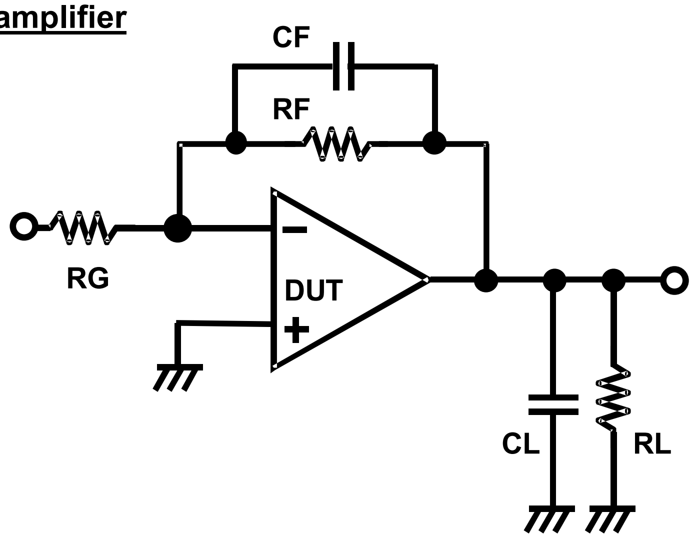
non-inverting amplifier
1.The closed gain should be 6dB or higher to prevent the oscillation.
Unity gain follower application may cause the oscillation.
2.When the closed gain is lower than 20dB, use a compensation capacitor (CF: about 5pF), parallel with the feedback resistor RF to avoid oscillation.
3.Recommended feedback resistor is less than 2k-ohm to keep the flatness of the frequency response.
4.Minimize the load capacitor for the better performance.
A large load capacitor CL reduces the frequency response and causes oscillation or ringing.

inverting amplifier
1.When the closed gain is lower than 20dB, use a compensation capacitor (CF; recommended from 1pF to 5pF), parallel with the feedback resistor RF to avoid oscillation.
2.Minimize the feedback resistor to keep the frequency response and the slew rate.
(recommended about 1k-ohm)
The proper compensation capacitor CF can counteract oscillation even with a large feedback resistor RF.
3.Total load capacitance should be not more than 100pF.
The oscillation margin may be affected by the total load capacitance.

non-inverting amplifier

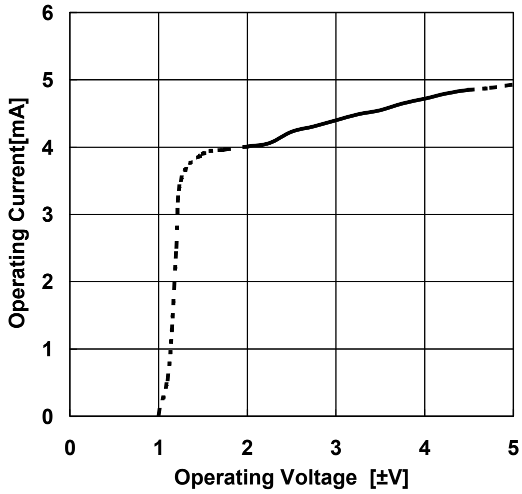


inverting amplifier

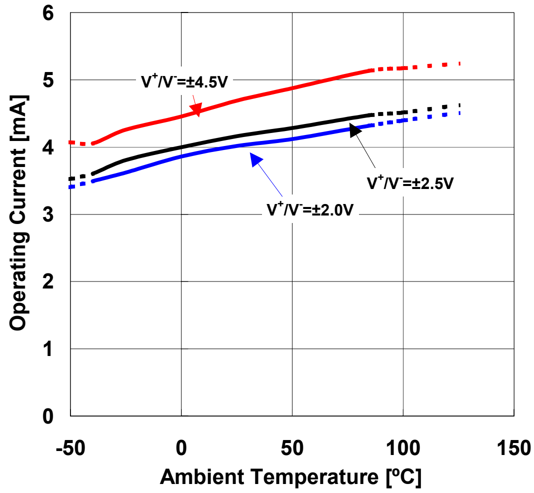


■ TYPICAL CHARACTERISTICS

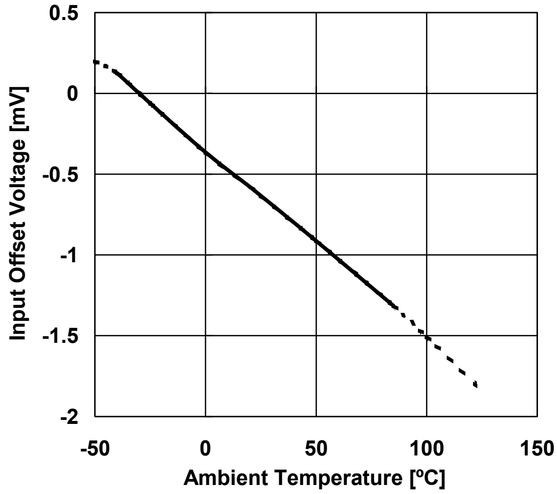
Operating Current vs. Operating Voltage
V_{IN}=0V, Ta=25ºC



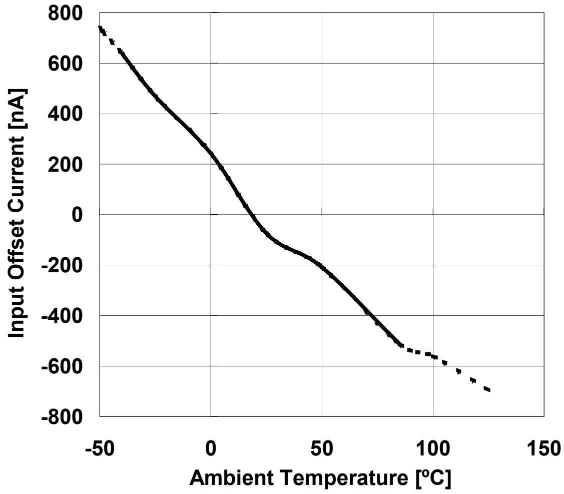
Operating Current vs. Temperature
V_{IN}=0V



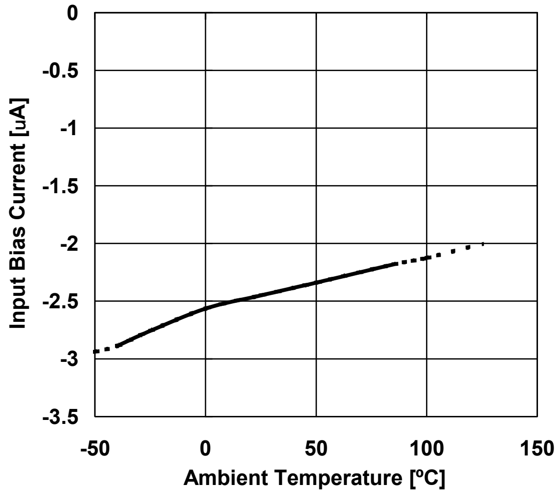
Input Offset Voltage vs. Temperature
V^+/V^-=±2.5V



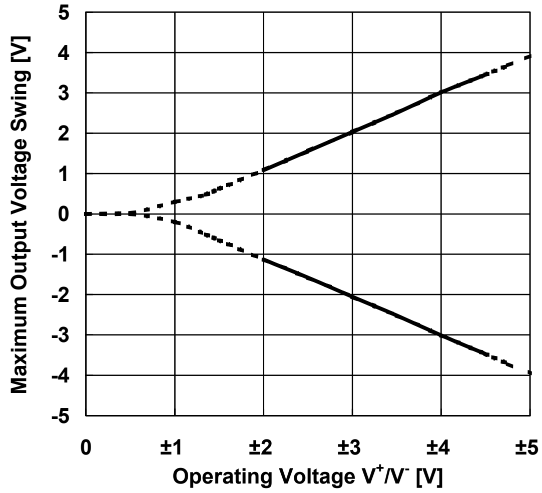
Input Offset Current vs. Temperature
V^+/V^-=±2.5V



Input Bias Current vs. Temperature
V^+/V^-=±2.5V

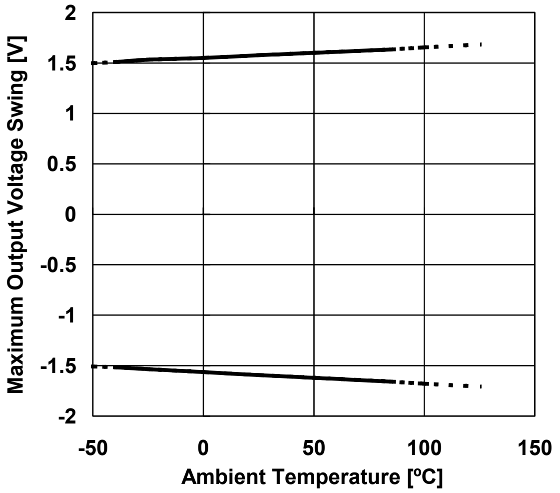


Maximum Output Voltage Swing vs. Operating Voltage
V_{IN}=±300mV, R_L=1kΩ, Ta=25ºC



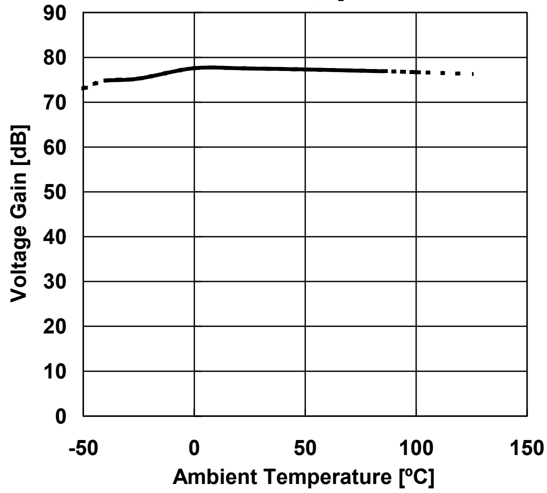
Maximum Output Voltage Swing vs. Temperature

$V^+/V^-=\pm2.5V$



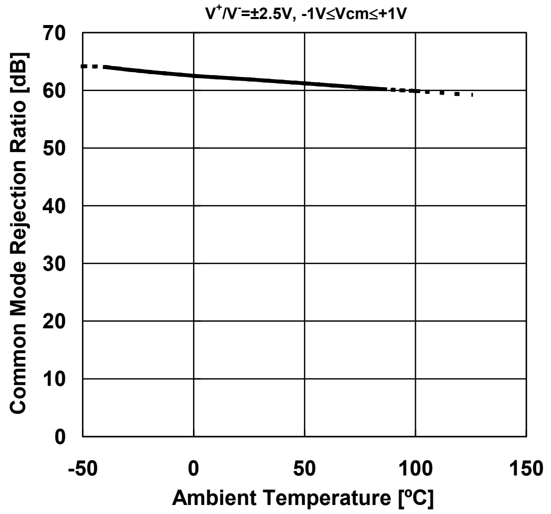
Voltage Gain vs. Temperature

$V^+/V^-=\pm2.5V$, $R_L=2k\Omega$



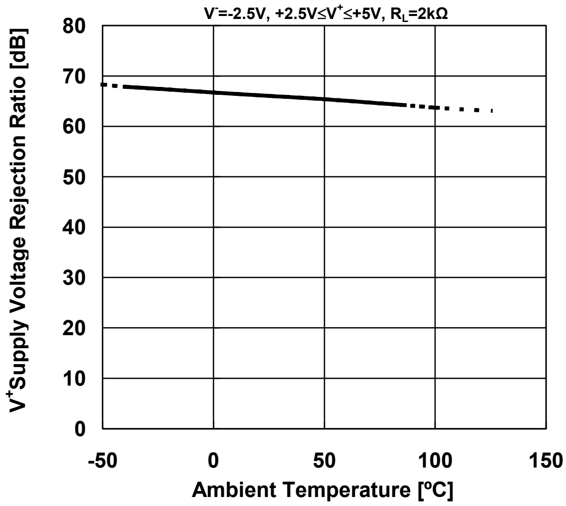
Common Mode Rejection Ratio vs. Temperature

$V^+/V^-=\pm2.5V$, $-1V\leq Vcm\leq+1V$



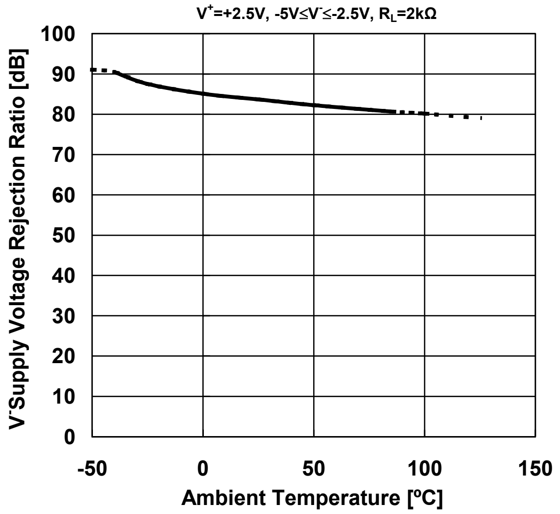
V^+Supply Voltage Rejection Ratio vs. Temperature

$V^-=-2.5V$, $+2.5V\leq V^+\leq+5V$, $R_L=2k\Omega$



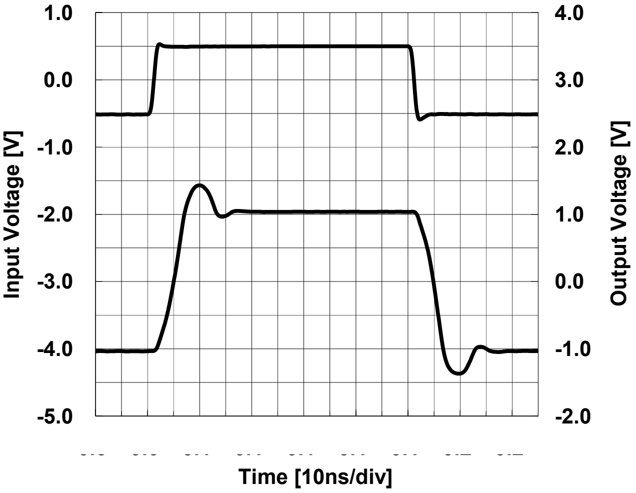
V^-Supply Voltage Rejection Ratio vs. Temperature

$V^+=+2.5V$, $-5V\leq V^-\leq-2.5V$, $R_L=2k\Omega$



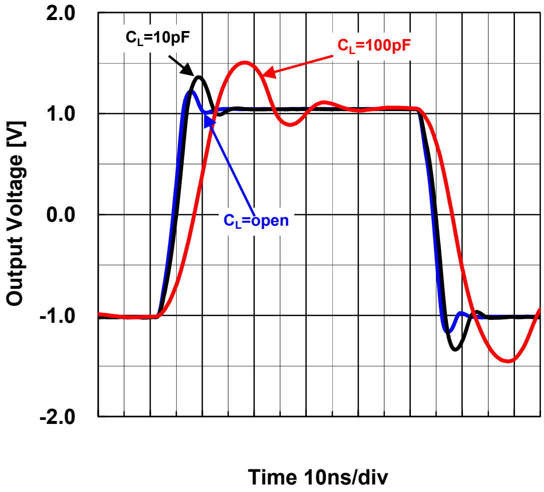
Pulse Response

$V^+/V^-=\pm2.5V$, f=5MHz, $V_O=2V_{PP}$, $G_V=6dB$, $R_T=50\Omega$,
$R_F=1k\Omega$, $C_F=5pF$, $R_G=1k\Omega$, $R_L=2k\Omega$, $C_L=10pF$, Ta=+25ºC



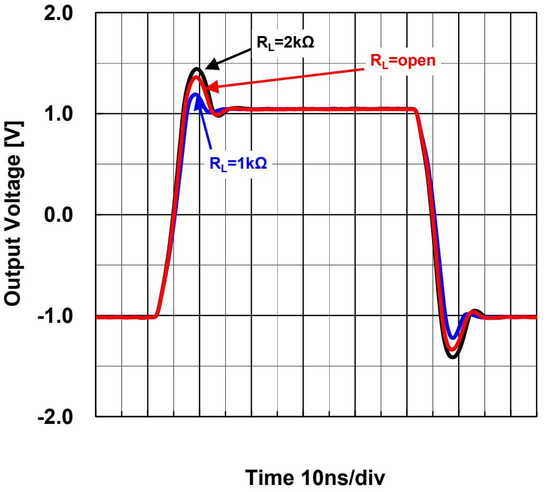
Pulse Response (with capacitive load)

$V^+/V^-=\pm2.5V$, f=5MHz, $V_O=2V_{PP}$, $G_V=6dB$,
$R_T=50\Omega$, $R_F=1k\Omega$, $C_F=5pF$, $R_G=1k\Omega$, Ta=+25ºC



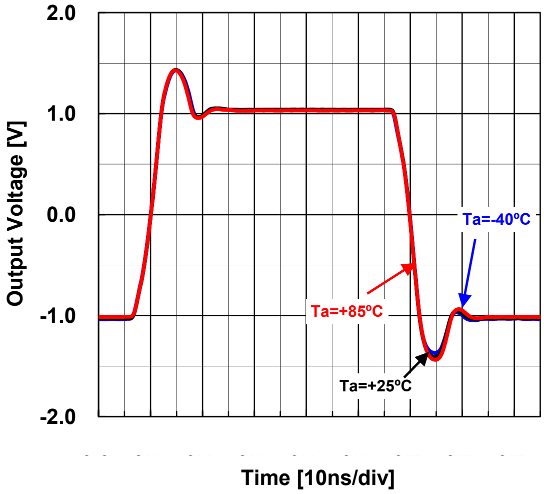
Pulse Response (correlation with R_L)

$V^+/V^-=\pm2.5V$, f=5MHz, $V_O=2V_{PP}$, $G_V=6dB$, $R_T=50\Omega$,
$R_F=1k\Omega$, $C_F=5pF$, $R_G=1k\Omega$, $C_L=10pF$, Ta=+25ºC



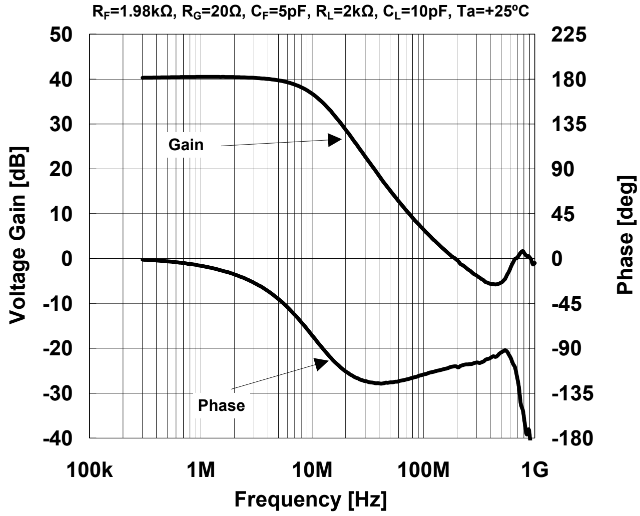
Pulse Response (correlation with Ta)

$V^+/V^-=\pm2.5V$, f=5MHz, $V_O=2V_{PP}$, $G_V=6dB$, $R_T=50\Omega$,
$R_F=1k\Omega$, $C_F=5pF$, $R_G=1k\Omega$, $C_L=10pF$, Ta=+25ºC



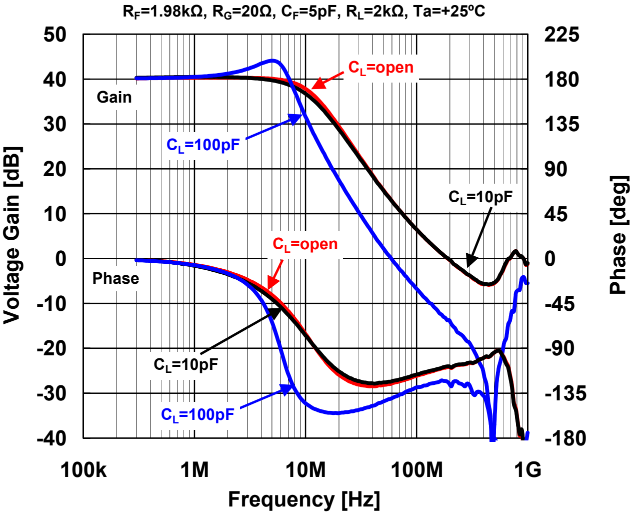
Voltage Gain vs. Frequency

$V^+/V^-=\pm2.5V$, $V_{IN}=0.02Vpp$, $G_V=40dB$, $R_T=50\Omega$,
$R_F=1.98k\Omega$, $R_G=20\Omega$, $C_F=5pF$, $R_L=2k\Omega$, $C_L=10pF$, Ta=+25ºC

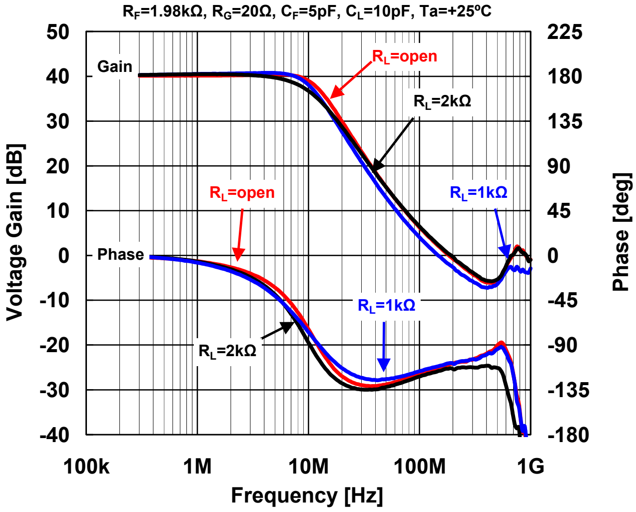


Voltage Gain vs. Frequency (with Capacitive Load)

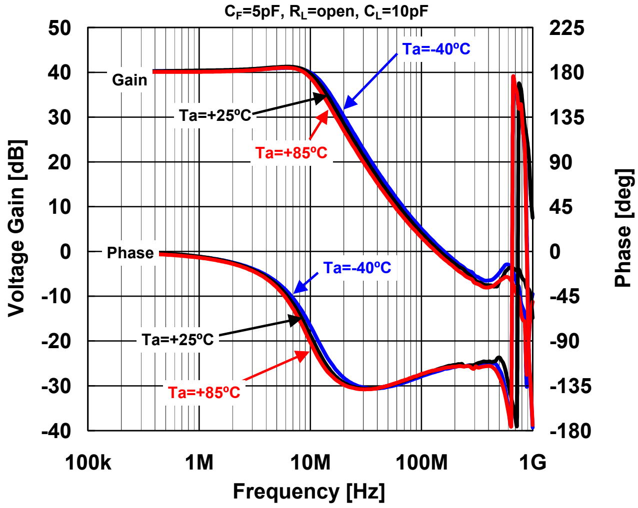
$V^+/V^-=\pm2.5V$, $V_{IN}=0.02Vpp$, $G_V=40dB$, $R_T=50\Omega$,
$R_F=1.98k\Omega$, $R_G=20\Omega$, $C_F=5pF$, $R_L=2k\Omega$, Ta=+25ºC



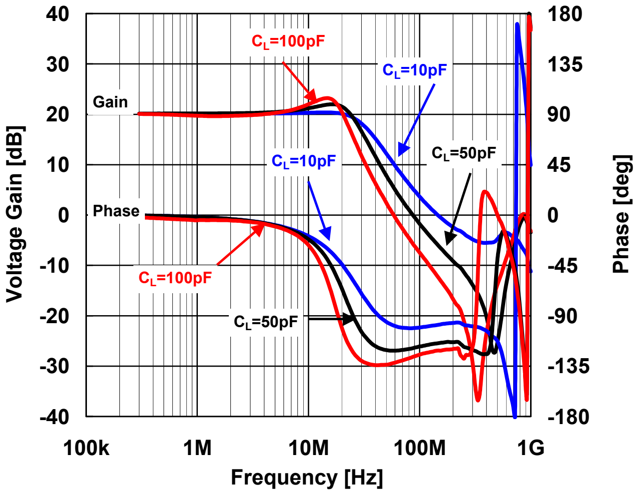
Voltage Gain vs. Frequency
(correlation with R_L)
V^+/V^-=±2.5V, V_{IN}=0.02Vpp, G_V=40dB, R_T=50Ω, R_F=1.98kΩ, R_G=20Ω, C_F=5pF, C_L=10pF, Ta=+25ºC



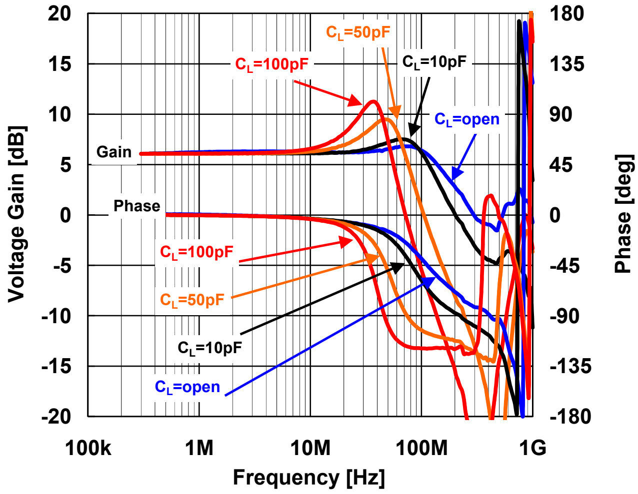
Voltage Gain vs. Frequency
(correlation with Ta)
V^+/V^-=±2.5V, V_{IN}=0.02Vpp, G_V=40dB, R_T=50Ω, R_F=1.98kΩ, R_G=20Ω, C_F=5pF, R_L=open, C_L=10pF



Voltage Gain vs. Frequency
(with Capacitive Load)
V^+/V^-=±2.5V, V_{IN}=0.02Vpp, G_V=20dB, R_T=50Ω, R_F=1kΩ, C_F=5pF, R_G=110Ω, R_L=open, Ta=+25ºC



Voltage Gain vs. Frequency (with Capacitive Load)
V^+/V^-=±2.5V, V_{IN}=0.02Vpp, G_V=6dB, R_T=50Ω, R_F=1kΩ, C_F=5pF, R_G=1kΩ, R_L=open, Ta=+25ºC



■ MEASUREMENT CIRCUIT