ULTRA HIGH SPEED SINGLE OPERATIONAL AMPLIFIER

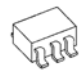
■ GENERAL DESCRIPTION

The **NJM2711** is an ultra high speed single operational amplifier.

It can swings 260V/µs high slew rate and 1GHz gain band width product(10MHz typ. at 40dB) at ±2.5V.

It is suitable for pickup circuit of CD-R/RW or DVD-R/RW, wideband video system, high resolution scanner or FAX, high speed telecommunications, and any other high speed signal processing system.

■ PACKAGR OUTLINE



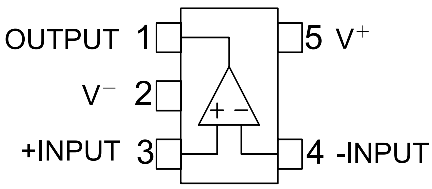
NJM2711F

■ FEATURES

・Operating Voltage	(±2.0 to ±4.5V)
・Operating Current	(1.9mA 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)
・Open Loop Voltage Gain	(75dB typ.)
・Bipolar Technology	
・Package Outline	SOT-23-5

■ PIN CONFIGURATION

NJM2711F
(Top View)



PIN FUNCTION
1.OUTPUT
2.V^-
3.+INPUT
4.-INPUT
5. 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	200	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	-	1.9	3.4	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)

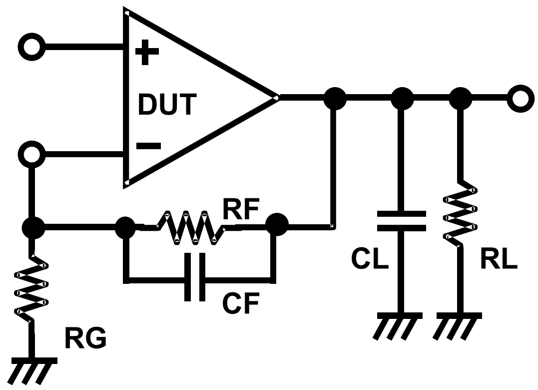
PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Slew Rate	+SR	Av=6dB,R_f=1kΩ,Rg=1kΩ R_L=∞,CL=10pF	-	260	-	V/μs
	-SR		-	260	-	V/μs

■ Note:

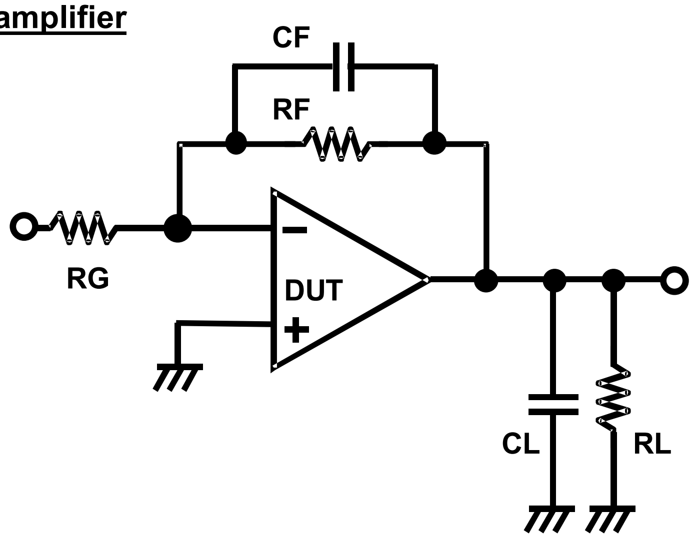
non-inverting amplifier
1.The closed gain should be 6dB or higher to prevent the oscillation.
Unity gain follower application may cause the oscillation.
2.When the closed gain is lower than 20dB, use a compensation capacitor (CF: about 5pF), parallel with the feedback resistor RF to avoid oscillation.
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

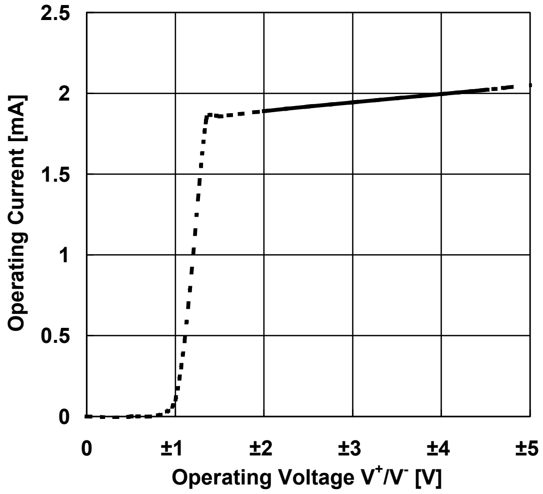


inverting amplifier

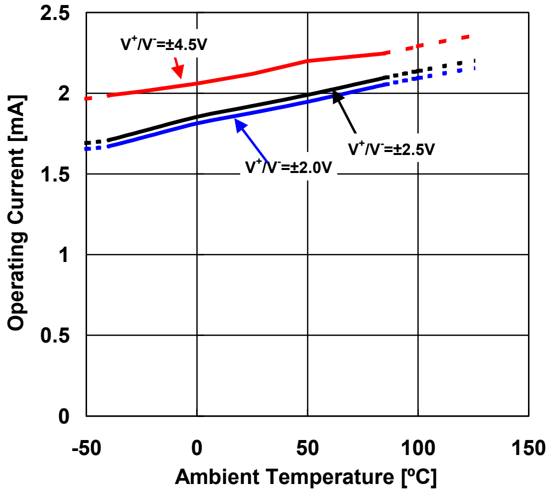


■ TYPICAL CHARACTERISTICS

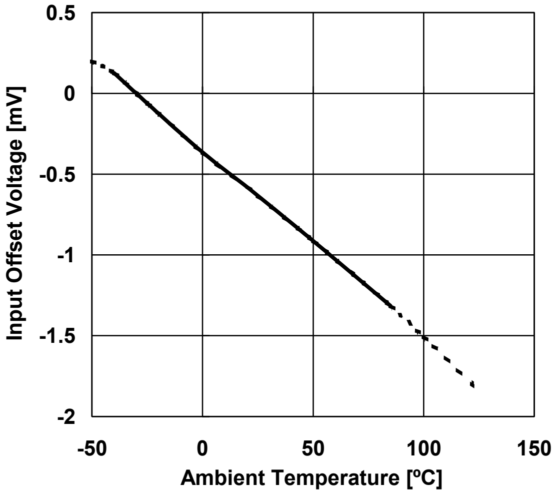
Operating Current vs. Operating Voltage
V_{IN}=0V, Ta=25ºC



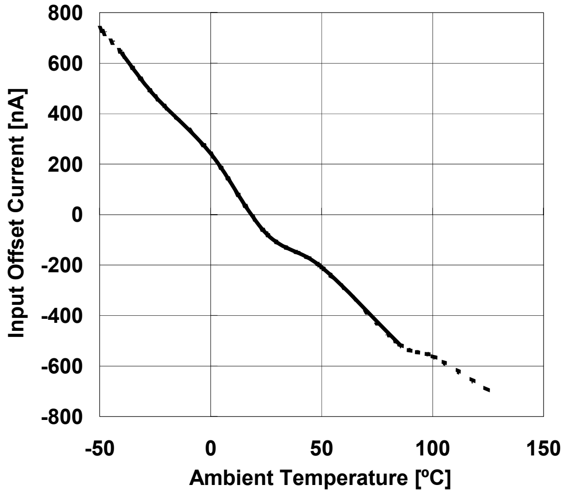
Operating Current vs. Temperature
V_{IN}=0V



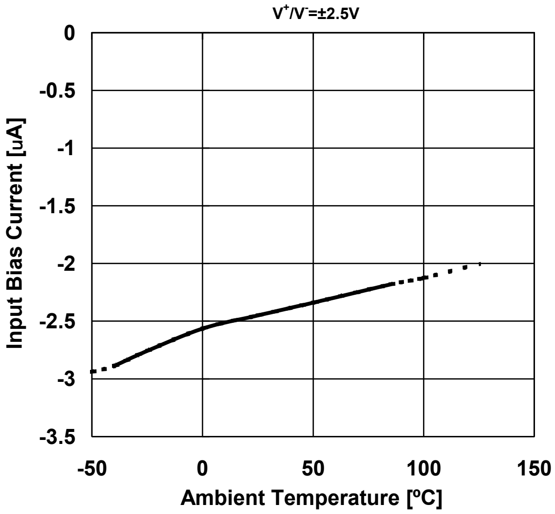
Input Offset Voltage vs. Temperature
V^+/V^-=±2.5V



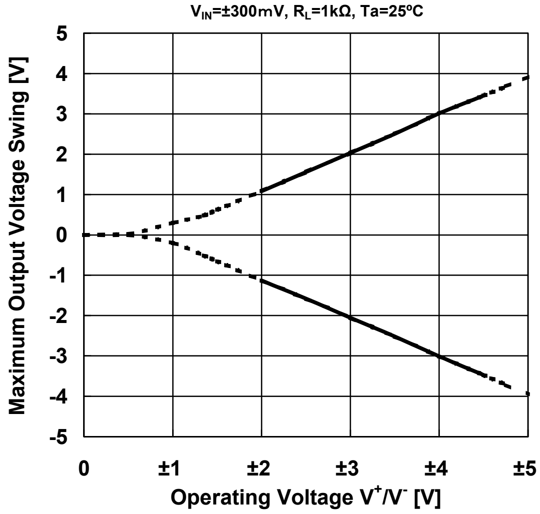
Input Offset Current vs. Temperature
V^+/V^-=±2.5V

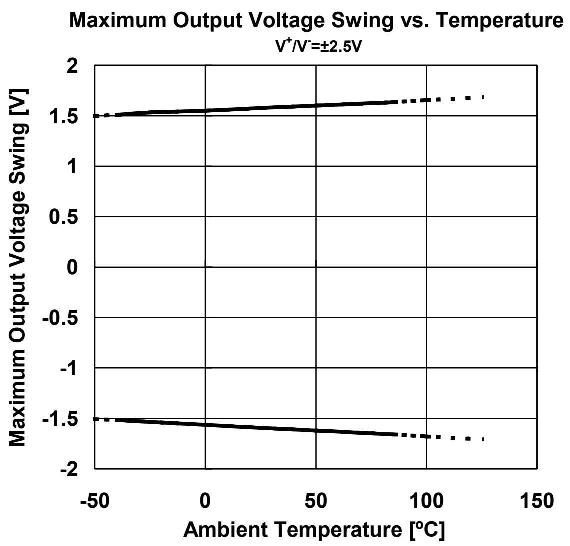


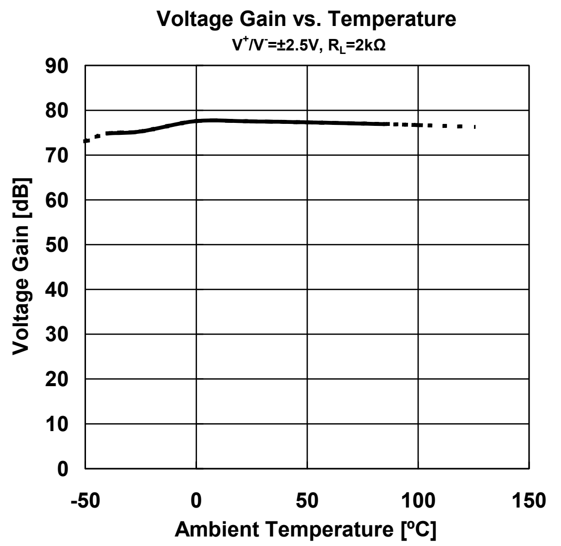
Input Bias Current vs. Temperature
V^+/V^-=±2.5V

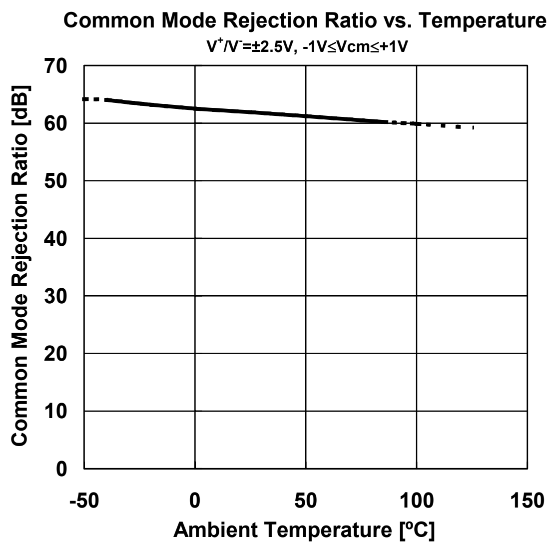


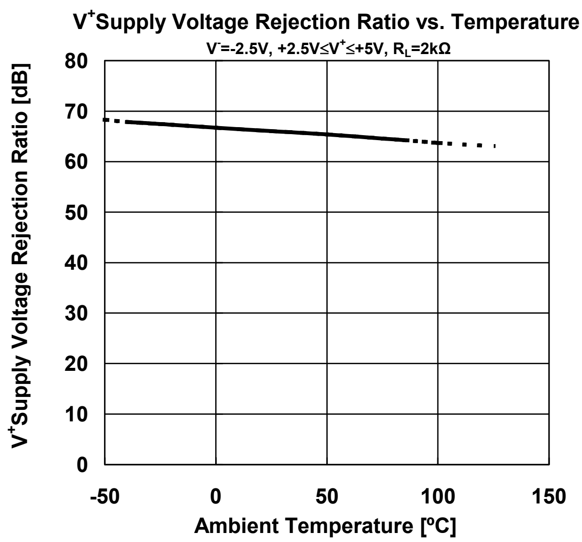
Maximum Output Voltage Swing
vs. Operating Voltage
V_{IN}=±300mV, R_L=1kΩ, Ta=25ºC

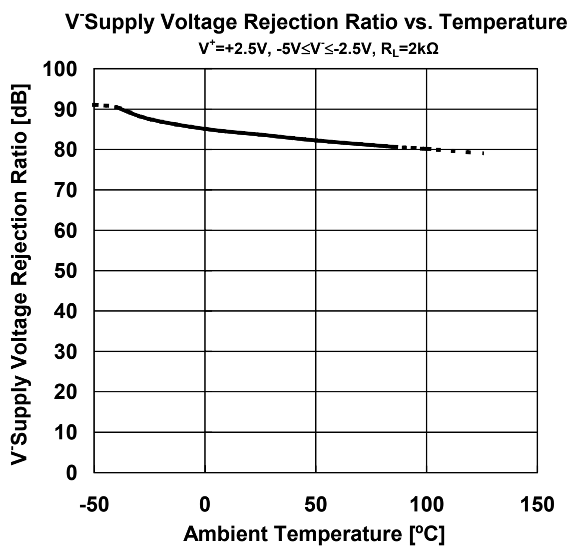



Maximum Output Voltage Swing vs. Temperature
V+/V-=±2.5V
Maximum Output Voltage Swing [V]
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-50
0
50
100
150
Ambient Temperature [ºC]


Voltage Gain vs. Temperature
V+/V-=±2.5V, RL=2kΩ
Voltage Gain [dB]
90
80
70
60
50
40
30
20
10
0
-50
0
50
100
150
Ambient Temperature [ºC]

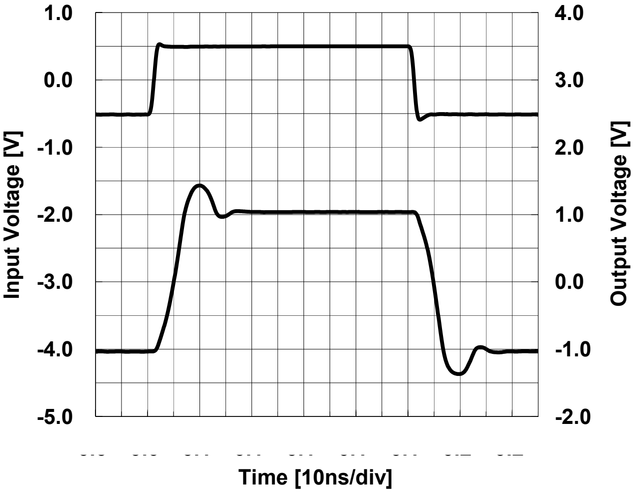

Common Mode Rejection Ratio vs. Temperature
V+/V-=±2.5V, -1V≤Vcm≤+1V
Common Mode Rejection Ratio [dB]
70
60
50
40
30
20
10
0
-50
0
50
100
150
Ambient Temperature [ºC]


V+Supply Voltage Rejection Ratio vs. Temperature
V-=-2.5V, +2.5V≤V+≤+5V, RL=2kΩ
V+Supply Voltage Rejection Ratio [dB]
80
70
60
50
40
30
20
10
0
-50
0
50
100
150
Ambient Temperature [ºC]


V-Supply Voltage Rejection Ratio vs. Temperature
V+=+2.5V, -5V≤V-≤-2.5V, RL=2kΩ
V-Supply Voltage Rejection Ratio [dB]
100
90
80
70
60
50
40
30
20
10
0
-50
0
50
100
150
Ambient Temperature [ºC]

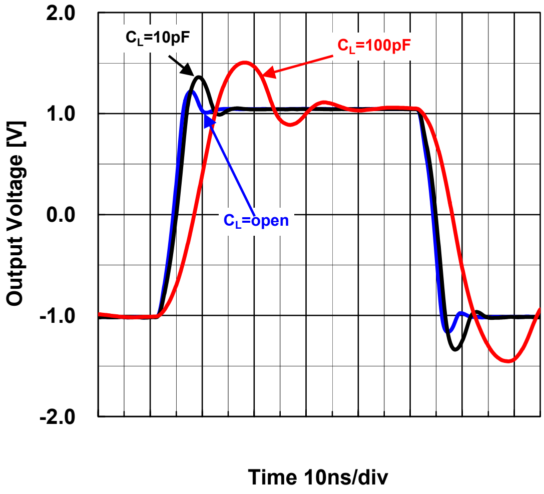
Pulse Response

V^{+}/V^{-}=±2.5V, f=5MHz, V_O=2V_{PP}, G_V=6dB, R_T=50Ω, R_F=1kΩ, C_F=5pF, R_G=1kΩ, R_L=2kΩ, C_L=10pF, Ta=+25ºC



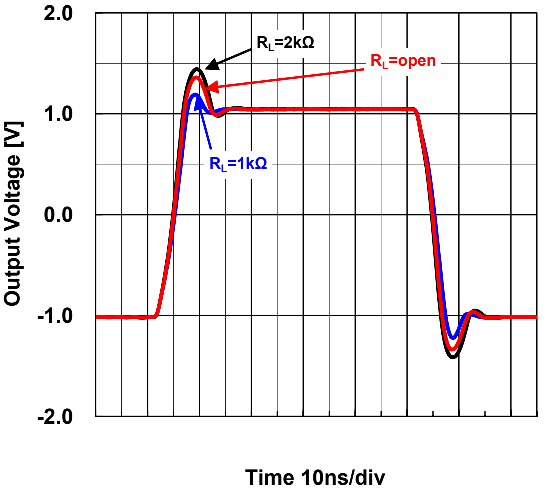
Pulse Response (with capacitive load)

V^{+}/V^{-}=±2.5V, f=5MHz, V_O=2V_{PP}, G_V=6dB, R_T=50Ω, R_F=1kΩ, C_F=5pF, R_G=1kΩ, Ta=+25ºC



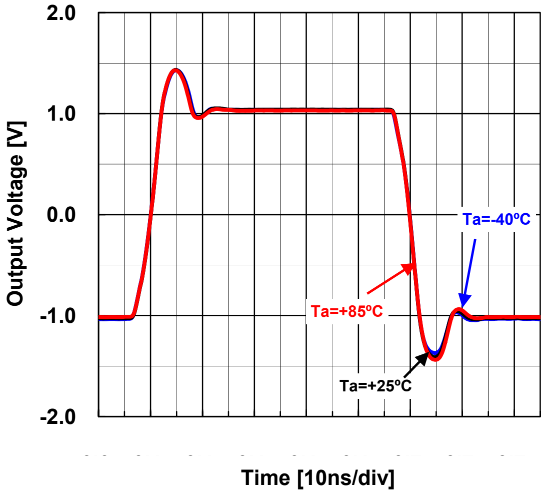
Pulse Response (correlation with R_L)

V^{+}/V^{-}=±2.5V, f=5MHz, V_O=2V_{PP}, G_V=6dB, R_T=50Ω, R_F=1kΩ, C_F=5pF, R_G=1kΩ, C_L=10pF, Ta=+25ºC



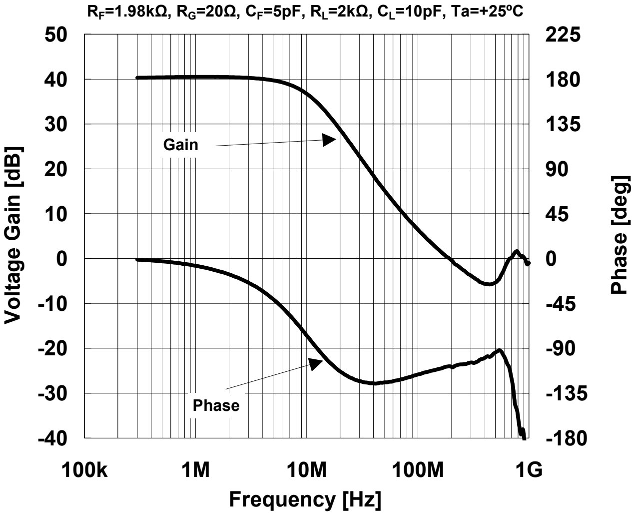
Pulse Response (correlation with Ta)

V^{+}/V^{-}=±2.5V, f=5MHz, V_O=2V_{PP}, G_V=6dB, R_T=50Ω, R_F=1kΩ, C_F=5pF, R_G=1kΩ, C_L=10pF, Ta=+25ºC



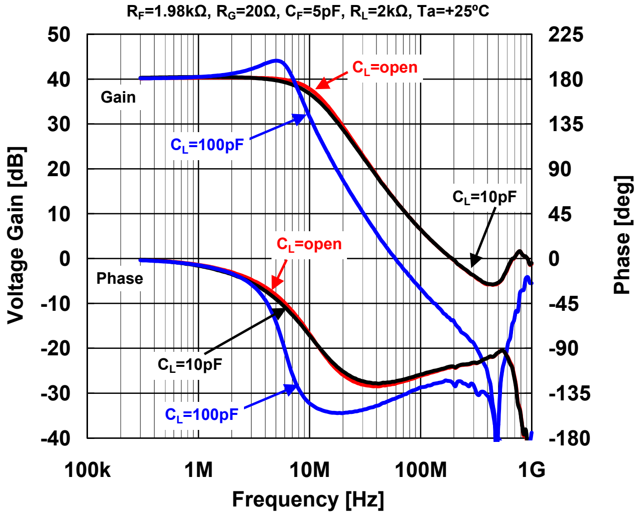
Voltage Gain vs. Frequency

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=2kΩ, C_L=10pF, Ta=+25ºC



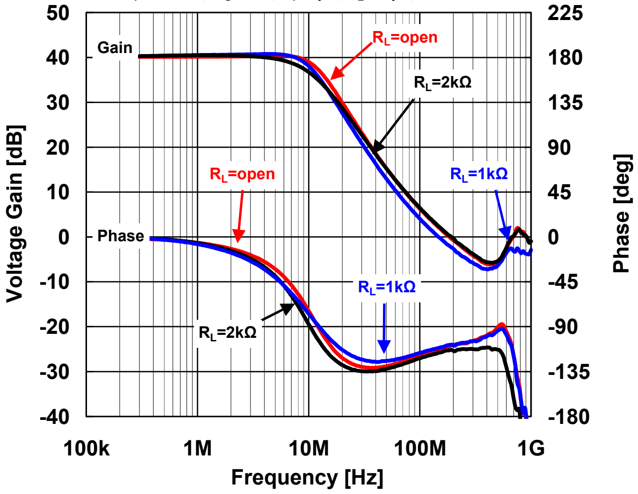
Voltage Gain vs. Frequency (with Capacitive Load)

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=2kΩ, Ta=+25ºC



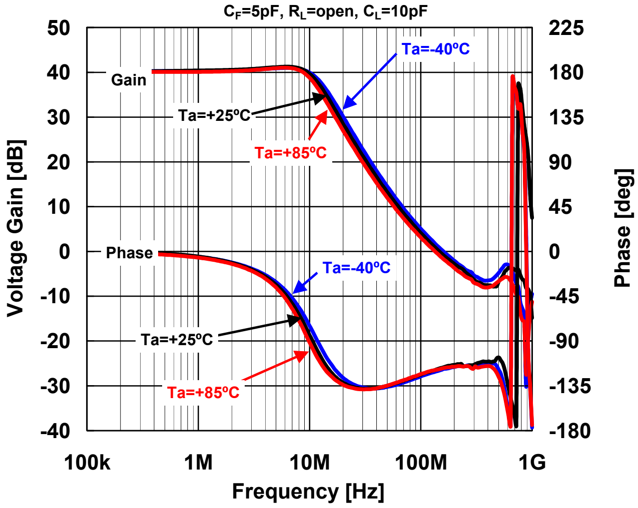
Voltage Gain vs. Frequency
(correlation with R_L)

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



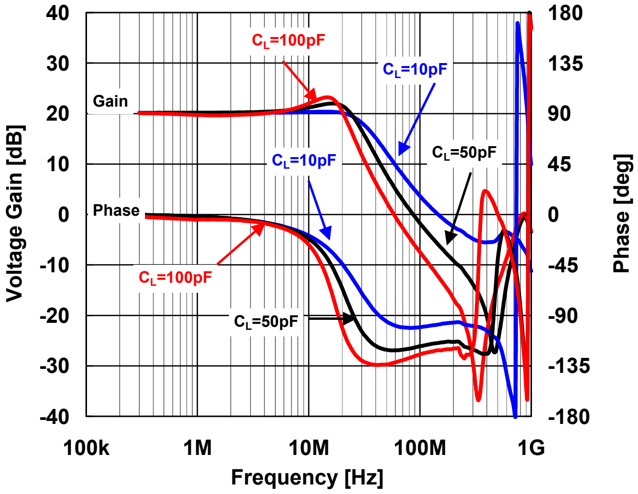
Voltage Gain vs. Frequency
(correlation with Ta)

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



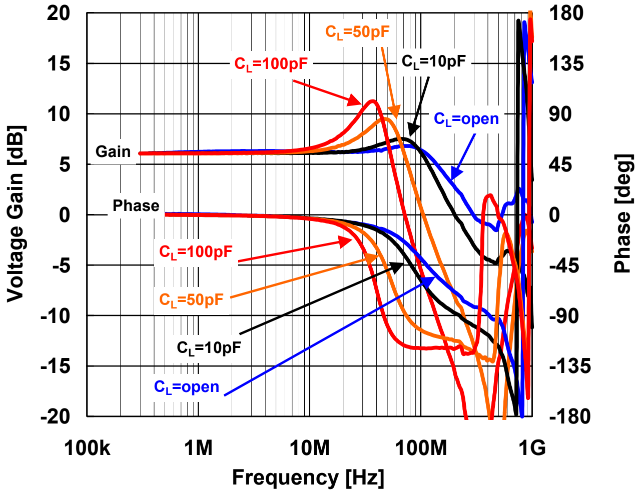
Voltage Gain vs. Frequency
(with Capacitive Load)

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