

ULTRA HIGH SPEED SINGLE OPERATIONAL AMPLIFIER

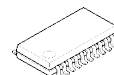
■ GENERAL DESCRIPTION

The **NJM2710** is an ultra high speed hex operational amplifier.

It can swings 260V/μs high slew rate and 1GHz gain band width product(10MHz typ. at 40dB) at 5V.

It is suitable for telecommunication related system, digital broadcasting system, high quality scanner and any other high speed signal processing system.

■ PACKAGR OUTLINE



NJM2710M

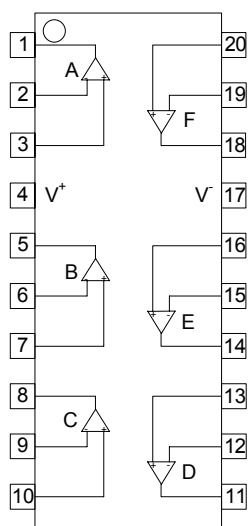


NJM2710V

■ FEATURES

- Operating Voltage (±2.0 to ±4.5V)
- Operating Current (11.4mA typ. at $V^+/V^- = \pm 2.5V$)
- 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 $R_L = 1k\Omega$)
- Open Loop Voltage Gain (75dB typ.)
- Bipolar Technology
- Package Outline DMP20, SSOP20

■ PIN CONFIGURATION



**NJM2710E
NJM2710V
(TOP VIEW)**

Pin Function

- | | |
|--------------|--------------|
| 1. A OUTPUT | 11. D OUTPUT |
| 2. A -INPUT | 12. D -INPUT |
| 3. A +INPUT | 13. D +INPUT |
| 4. V^+ | 14. E OUTPUT |
| 5. B OUTPUT | 15. E -INPUT |
| 6. B -INPUT | 16. E +INPUT |
| 7. B +INPUT | 17. V^- |
| 8. C OUTPUT | 18. F OUTPUT |
| 9. C -INPUT | 19. F -INPUT |
| 10. C +INPUT | 20. F +INPUT |

■ 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	(DMP20, SSOP20)375	mW
Operating Temperature Range	T_{opr}	-40 to +85	°C
Storage Temperature Range	T_{stg}	-50 to +150	°C

■ DC CHARACTERISTICS ($V^+/V^- = \pm 2.5V$, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Operating Voltage Range	V^+/V^-		2.0	2.5	4.5	V
Operating Current	I_{CC}	No Signal	-	11.4	20.4	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	A_v	$R_L = 2k\Omega$	65	75	-	dB
Input Common Mode Voltage Range	V_{ICM}		± 1.3	± 1.5	-	V
Common Mode Rejection	CMR	$-1V \leq V_{CM} \leq +1V$	50	60	-	dB
Supply Voltage Rejection	+SVR	$2.5V \leq V^+ \leq 5V$, $R_L = 2k\Omega$	50	60	-	dB
	-SVR	$-5V \leq V^- \leq -2.5V$, $R_L = 2k\Omega$	50	60	-	dB
Maximum Output Voltage	V_{OM}	$R_L = 1k\Omega$	± 1.2	± 1.5	-	V

■ AC CHARACTERISTICS ($V^+/V^- = \pm 2.5V$, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Bandwidth	BW	$A_v = 40dB$, $R_f = 1.98k\Omega$, $R_L = \infty$, $C_L = 10pF$	-	10	-	MHz
Unity Gain Bandwidth	f_T	$A_v = 40dB$, $R_g = 20\Omega$, $R_f = 1.98k\Omega$, $R_L = \infty$, $C_L = 10pF$	-	180	-	MHz
Phase Margin	ϕ_M	$A_v = 40dB$, $R_g = 20\Omega$, $R_f = 1.98k\Omega$, $R_L = \infty$, $C_L = 10pF$	-	38	-	deg
Equivalent Input Noise Voltage	V_{NO}		-	6.8	-	nV/ $\sqrt{Hz}$

■ TRANSIENT CHARACTERISTICS ($V^+/V^- = \pm 2.5V$, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Slew Rate	+SR	$A_v = 6dB$, $R_f = 1k\Omega$, $R_g = 1k\Omega$	-	260	-	V/ μs
	-SR	$R_L = \infty$, $C_L = 10pF$	-	260	-	V/ μs

■ Note:

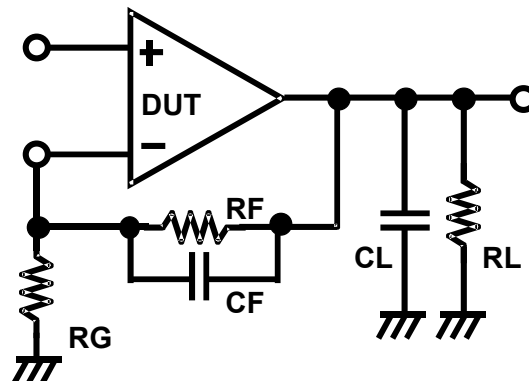
non-inverting amplifier

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 (C_F : about 5pF), parallel with the feedback resistor R_F to avoid oscillation.
3. Recommended feedback resistor is less than 2k Ω to keep the flatness of the frequency response.
4. Minimize the load capacitor for the better performance.
A large load capacitor C_L reduces the frequency response and causes oscillation or ringing.

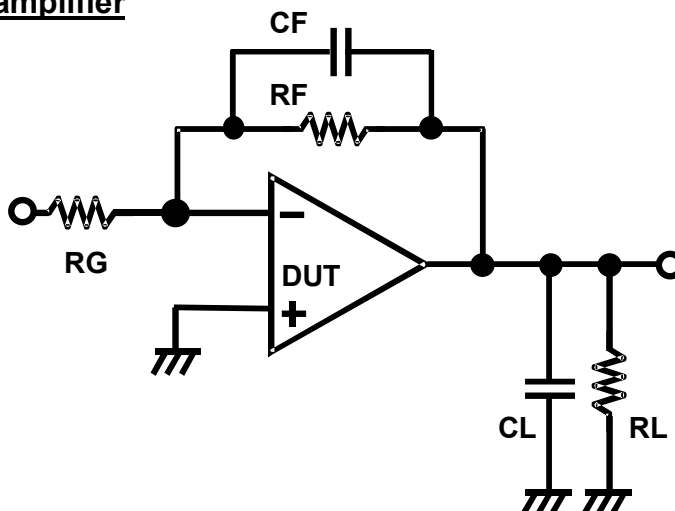
inverting amplifier

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

non-inverting amplifier



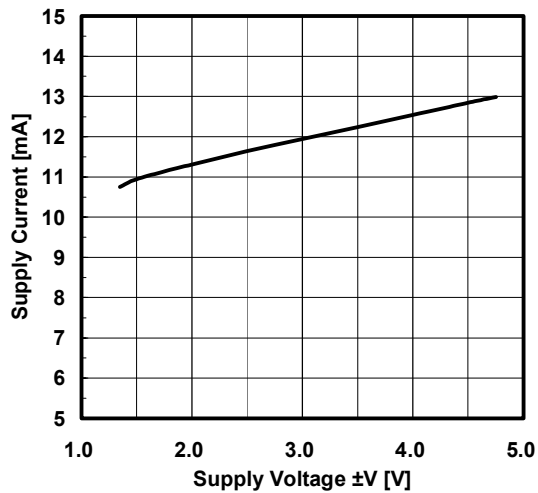
inverting amplifier



■ TYPICAL CHARACTERISTICS

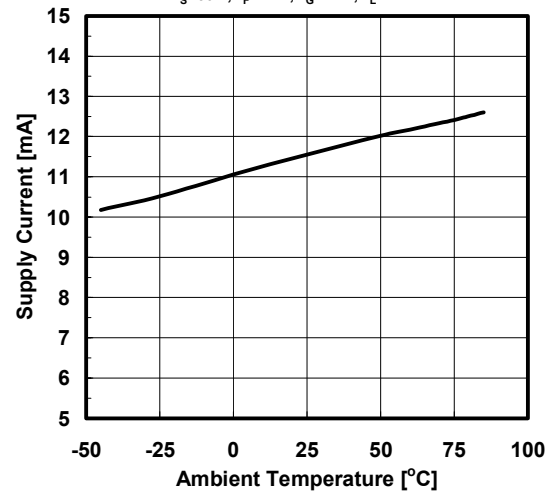
Supply Current vs. Supply Voltage

V_{IN} =No Signal, G_v =6dB, R_s =50 Ω
 R_F =1k Ω , R_G =1k Ω , R_L =2k Ω , T_a =+25 $^{\circ}$ C



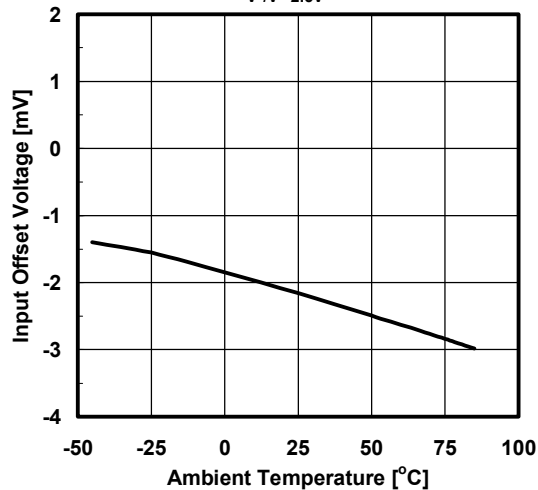
Supply Current vs. Ambient Temperature

V^+/V^- = $\pm 2.5V$, V_{IN} =No Signal, G_v =6dB
 R_s =50 Ω , R_F =1k Ω , R_G =1k Ω , R_L =2k Ω



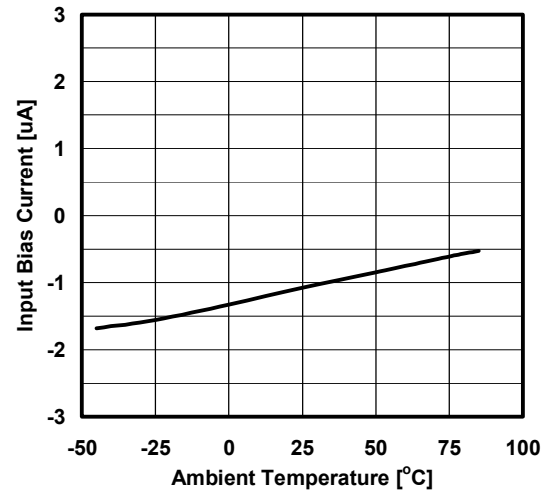
Input Offset Voltage
vs. Ambient Temperature

V^+/V^- =2.5V



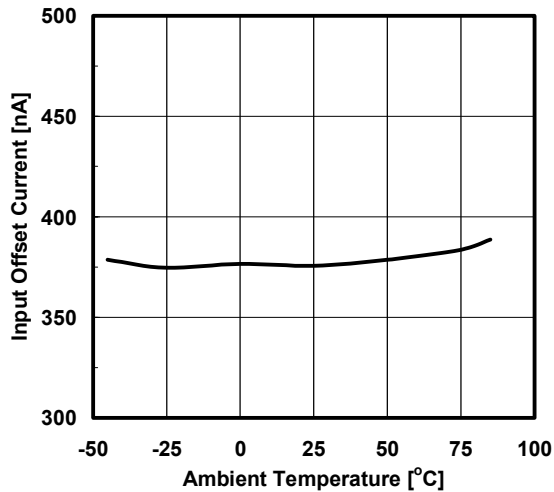
Input Bias Current vs. Ambient Temperature

V^+/V^- =2.5V



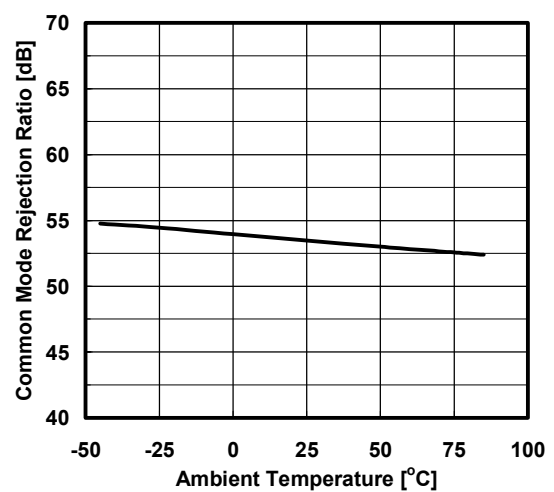
Input Offset Current
vs. Ambient Temperature

V^+/V^- =2.5V

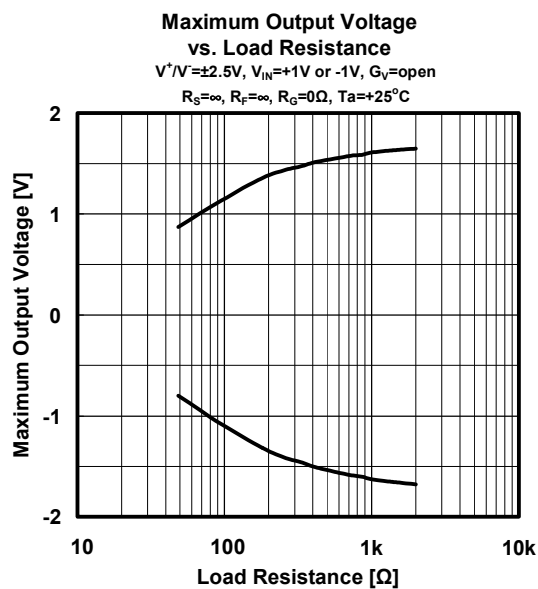
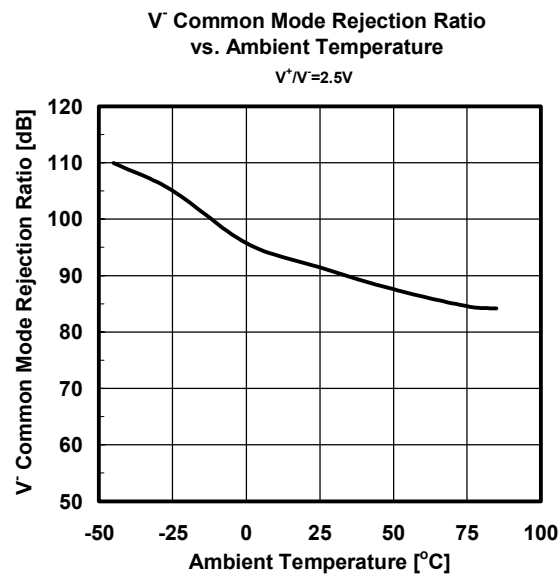
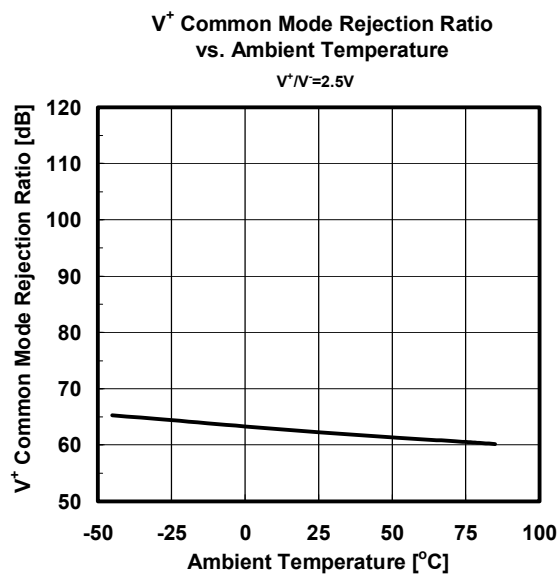


Common Mode Rejection Ratio
vs. Ambient Temperature

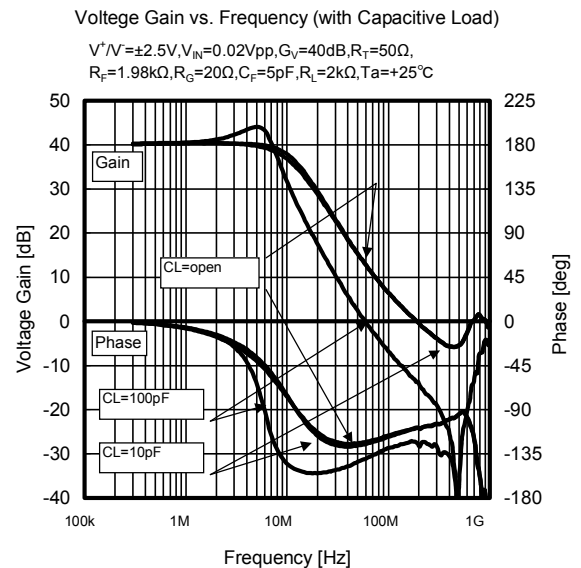
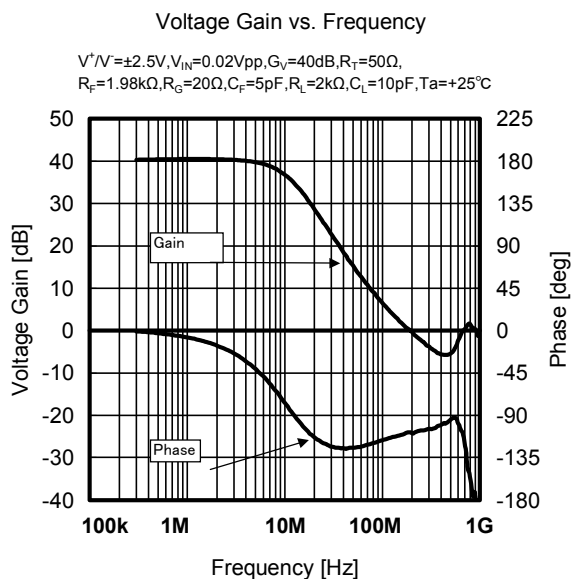
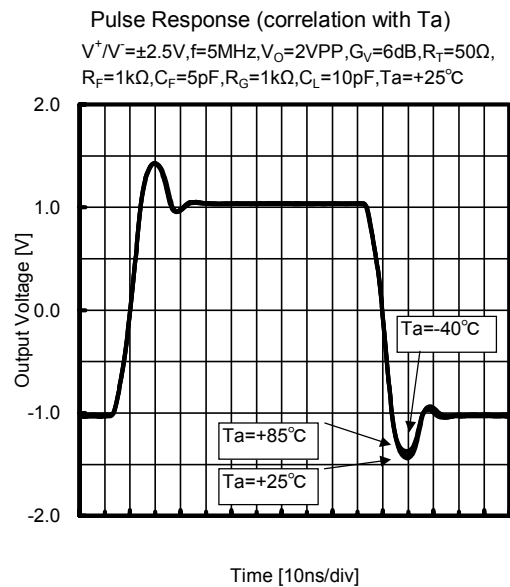
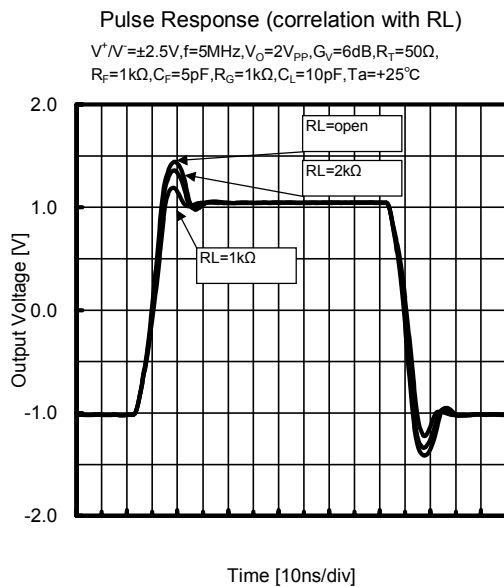
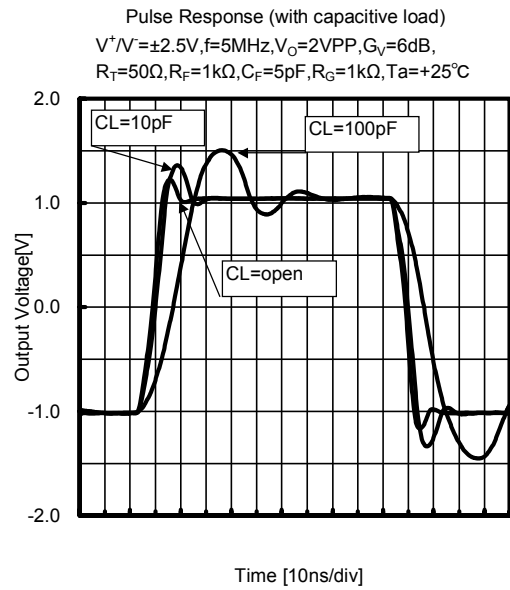
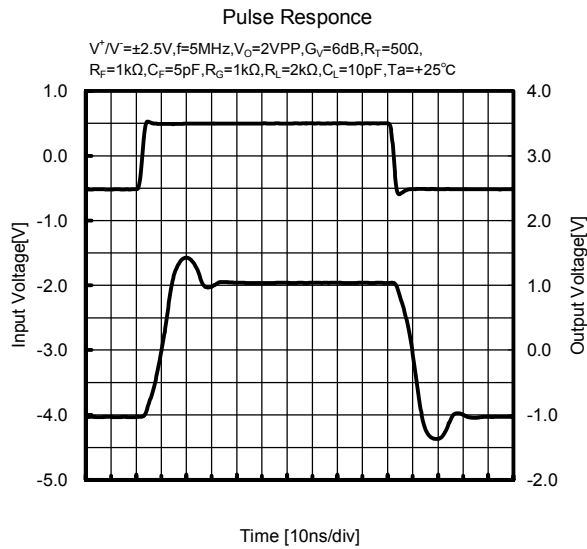
V^+/V^- =2.5V



■ TYPICAL CHARACTERISTICS



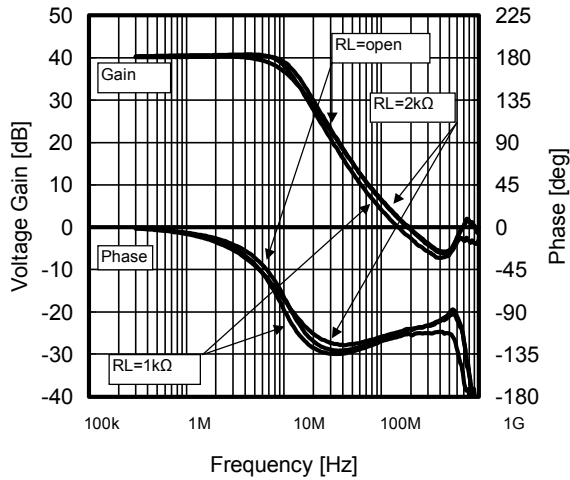
■ TYPICAL CHARACTERISTICS



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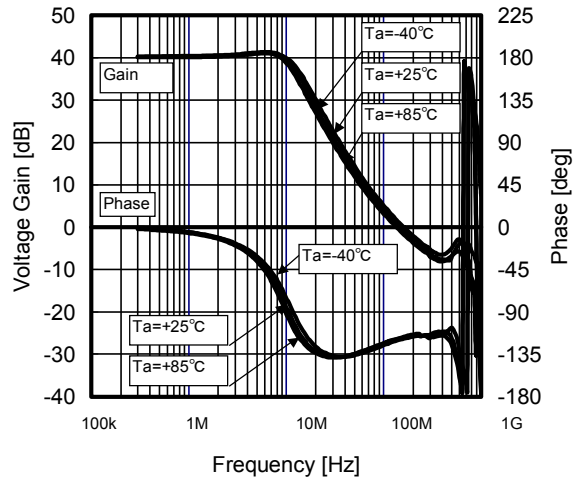
Voltage Gain vs. Frequency
(correlation with RL)

$V^+/V^- = \pm 2.5V$, $V_{IN} = 0.02V_{pp}$, $G_v = 40dB$, $R_T = 50\Omega$,
 $R_F = 1.98k\Omega$, $R_G = 20\Omega$, $C_F = 5pF$, $C_L = 10pF$, $T_a = +25^\circ C$



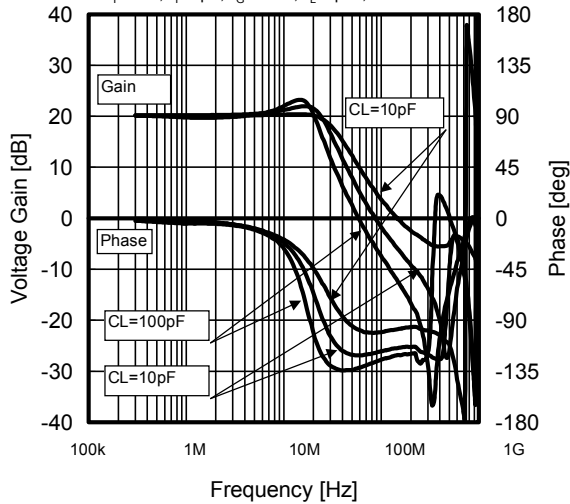
Voltage Gain vs. Frequency
(correlation with Ta)

$V^+/V^- = \pm 2.5V$, $V_{IN} = 0.02V_{pp}$, $G_v = 40dB$, $R_T = 50\Omega$, $R_F = 1.98k\Omega$,
 $R_G = 20\Omega$, $C_F = 5pF$, $R_L = open$, $C_L = 10pF$



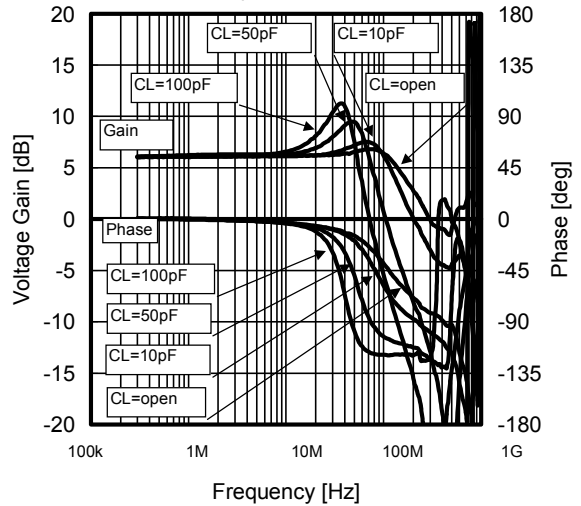
Voltage Gain vs. Frequency (with Capacitive Load)

$V^+/V^- = \pm 2.5V$, $V_{IN} = 0.02V_{pp}$, $G_v = 20dB$, $R_T = 50\Omega$,
 $R_F = 1k\Omega$, $C_F = 5pF$, $R_G = 110\Omega$, $R_L = open$, $T_a = +25^\circ C$

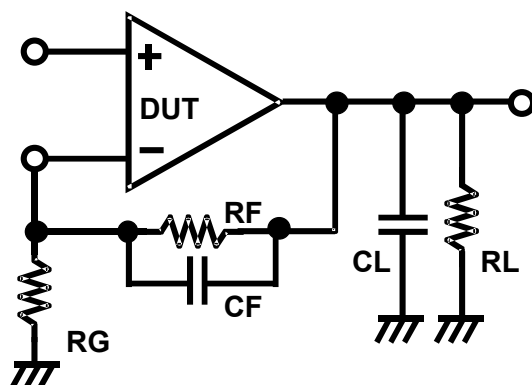


Voltage Gain vs. Frequency (with Capacitive Load)

$V^+/V^- = \pm 2.5V$, $V_{IN} = 0.02V_{pp}$, $G_v = 6dB$, $R_T = 50\Omega$,
 $R_F = 1k\Omega$, $C_F = 5pF$, $R_G = 1k\Omega$, $R_L = open$, $T_a = +25^\circ C$



■ MEASUREMENT CIRCUIT



[CAUTION]

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