

HIGH-SPEED AND HIGH OPERATING VOLTAGE OPERATIONAL AMPLIFIER

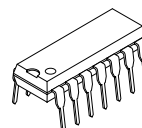
■ GENERAL DESCRIPTION

The NJM2727 is a high-speed, high operating voltage single operational amplifier.

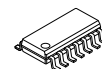
With 300V/μs slew rate, 40MHz unity gain bandwidth and 4mV input offset voltage the NJM2727 offers high performance.

The NJM2727 operates on ±15V power supply for systems requiring large voltage swings, such as industrial equipment.

■ PACKAGE OUTLINE



NJM2727D



NJM2727E

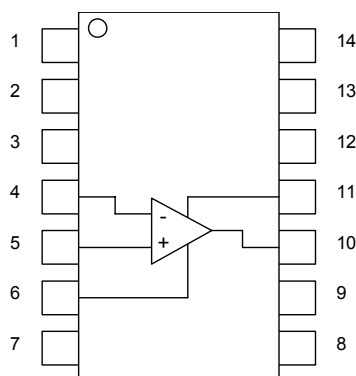
■ FEATURES

•Operating Voltage	± 4.5V to ± 18V
•Input Offset Voltage	$V_{IO}=4\text{mV max.}$
•Output Voltage	± 12V typ. (at $R_L=500\Omega$ $V^+/V^-=\pm 15\text{V}$)
•Unity Gain Bandwidth	40MHz typ.
•High Slew Rate	300V/μs typ. (at $R_L=500\Omega$ $V^+/V^-=\pm 15\text{V}$)
•Bipolar Technology	
•Package Outline	NJM2727D DIP14 NJM2727E EMP14

■ Application

- Active Filters
- ADC/DAC Buffers
- Line Drivers, Cable Drivers
- Pulse Amplifiers
- Ultrasound Amplifiers

■ PIN CONFIGURATION



NJM2727D
NJM2727E

PIN FUNCTION

1. NC	8. NC
2. NC	9. NC
3. NC	10. OUTPUT
4. -INPUT	11. V^+
5. +INPUT	12. NC
6. V^-	13. NC
7. NC	14. NC

■ABSOLUTE MAXIMUM RATINGS

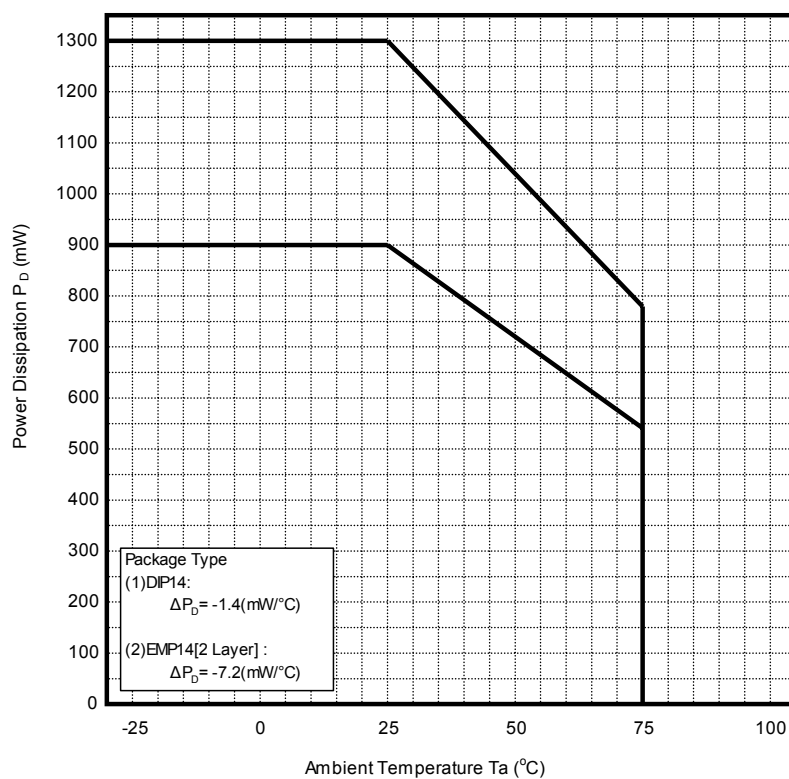
PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+ / V^-	± 20	V
Differential Input Voltage Range	V_{ID}	± 6	V
Common Mode Input Voltage Range	V_{ICM}	± 20 (Note 1)	V
Power Dissipation	P_D	1300 [DIP8] 900 [EMP8] (Note 2)	mW
Operating Temperature Range	T_{opr}	$-40 \sim +75$	$^{\circ}\text{C}$
Storage Temperature Range	T_{stg}	$-50 \sim +150$	$^{\circ}\text{C}$

(Note 1) For supply Voltages less than $\pm 20\text{V}$, the maximum input voltage is equal to the Supply Voltage.

(Note 2) On a PCB (76.2×114×31.6mm, two layers, FR-4)

(Note 3) 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 (T_a) is $T_a \geq 25^{\circ}\text{C}$.

Figure1 : Power Dissipation vs. Ambient Temperature



■RECOMMENDED OPERATING CONDITION ($T_a = 25^{\circ}\text{C}$)

PARAMETER	SYMBOL	RATING	Min.	Typ.	Max.	UNIT
Operating Voltage	V^+ / V^-		± 4.5	± 15	± 18	V

■ELECTRIC CHARACTERISTICS

●DC CHARACTERISTICS ($V^+/V^- = \pm 15V$, $T_a = 25^\circ C$)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current	I_{CC}	No Signal	-	10	13	mA
Input Offset Voltage	V_{IO}	$R_s = 50\Omega$, $R_F = 50k\Omega$	-	1	4	mV
Input Bias Current	I_B	$R_B = 500\Omega$	-	10	30	μA
Input Offset Current	I_{IO}	$R_B = 500\Omega$	-	0.2	1.2	μA
Large Signal Voltage Gain	A_V	$R_L = 2k\Omega$, $V_O = \pm 5V$	60	66	-	dB
Common Mode Rejection Ratio	CMR	$-11V \leq V_{ICM} \leq +11V$	80	100	-	dB
Supply Voltage Rejection Ratio	SVR	$V^+ / V^- = \pm 4.5V \sim \pm 18V$	70	80	-	dB
Maximum Output Voltage1	V_{OM1}	$R_L = 500\Omega$ (Note 3)	± 11	± 12	-	V
Maximum Output Voltage2	V_{OM2}	$R_L = 150\Omega$ (Note 3)	-	± 3	-	V
Input Common Mode Voltage Range	V_{ICM}	CMR $\geq 80dB$	± 11	± 12	-	V

●AC CHARACTERISTICS ($V^+/V^- = \pm 15V$, $T_a = 25^\circ C$)

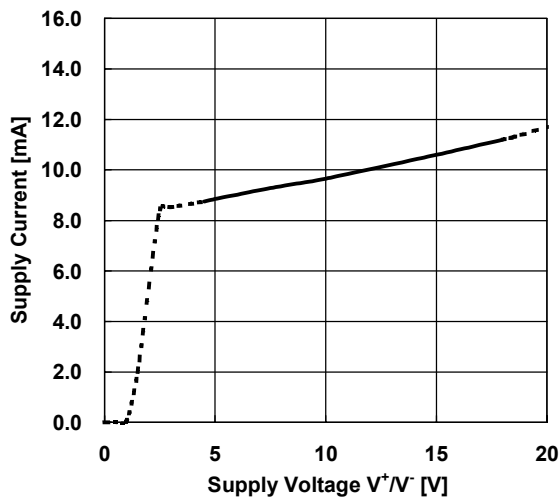
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Unity Gain Frequency	f_T	$A_V = 40dB$, $R_F = 1.98k\Omega$, $R_G = 20\Omega$ $R_L = \infty$, $C_L = 5pF$	-	40	-	MHz
Phase Margin	ϕ_M	$A_V = 40dB$, $R_F = 1.98k\Omega$, $R_G = 20\Omega$ $R_L = \infty$, $C_L = 5pF$	-	60	-	deg
Equivalent Input Noise Voltage	V_{NI}	$A_V = 40dB$, $R_F = 1.98k\Omega$, $R_G = 20\Omega$ $R_L = \infty$, $C_L = 5pF$, $f = 100kHz$	-	14	-	nV/ $\sqrt{Hz}$

●TRANSIENT CHARACTERISTICS ($V^+/V^- = \pm 15V$, $T_a = 25^\circ C$)

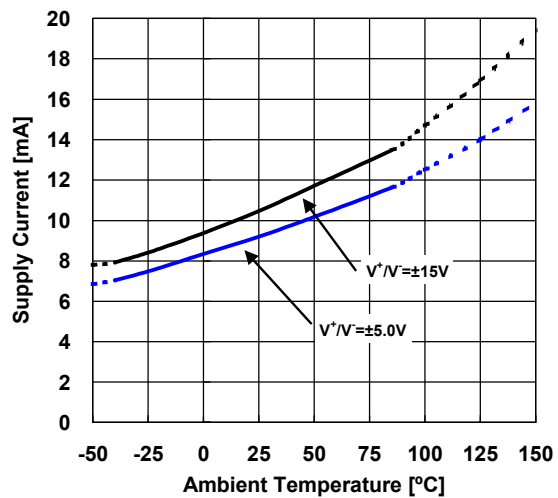
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate1	SR1P	Gain = +1, $R_F = 0\Omega$, $R_G = \infty$ $R_L = 500\Omega$, $C_L = 5pF$, $V_{IN} = 10V_{pp}$	-	300	-	V/ μs
	SR1N	Gain = -1, $R_F = 1k\Omega$, $R_G = 1k\Omega$ $R_L = \infty$, $C_L = 5pF$, $V_{IN} = 10V_{pp}$	-	300	-	V/ μs
Slew Rate2	SR2P	Gain = +1, $R_F = 0\Omega$, $R_G = \infty$ $R_L = 500\Omega$, $C_L = 5pF$, $V_{IN} = 1V_{pp}$	-	100	-	V/ μs
	SR2N	Gain = -1, $R_F = 1k\Omega$, $R_G = 1k\Omega$ $R_L = \infty$, $C_L = 5pF$, $V_{IN} = 1V_{pp}$	-	100	-	V/ μs
Differential Gain	DG	$A_V = 6dB$, $R_F = 2k\Omega$, $R_G = 2k\Omega$, $R_L = 150\Omega$, $C_L = 5pF$, $V_{IN} = 1V_{pp}(NTSC)$	-	0.09	-	%
Differential Phase	DP		-	0.64	-	deg

■ TYPICAL CHARACTERISTICS

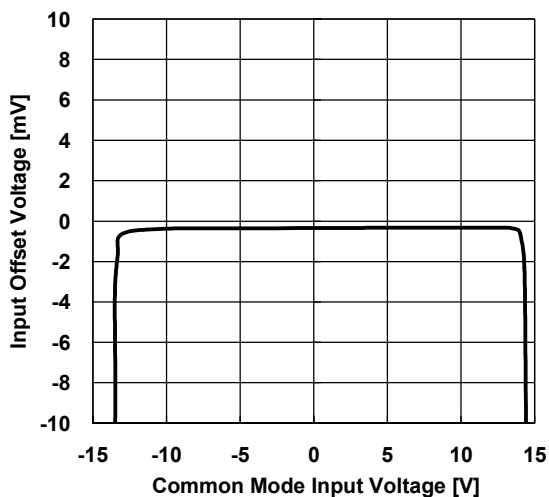
Supply Current vs. Supply Voltage
 $V_{IN}=0V$, $T_a=25^\circ C$



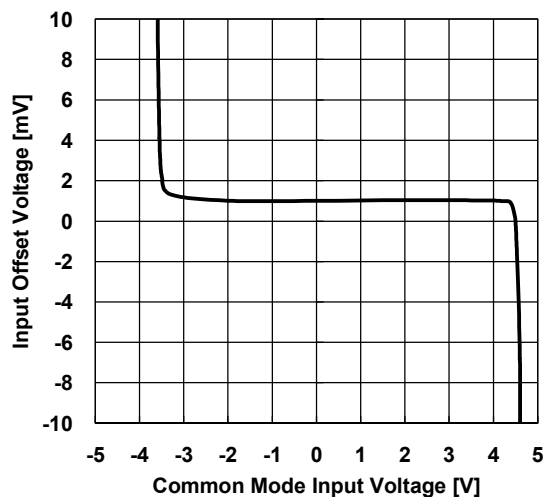
Supply Current vs. Ambient Temperature
 $V_{IN}=0V$



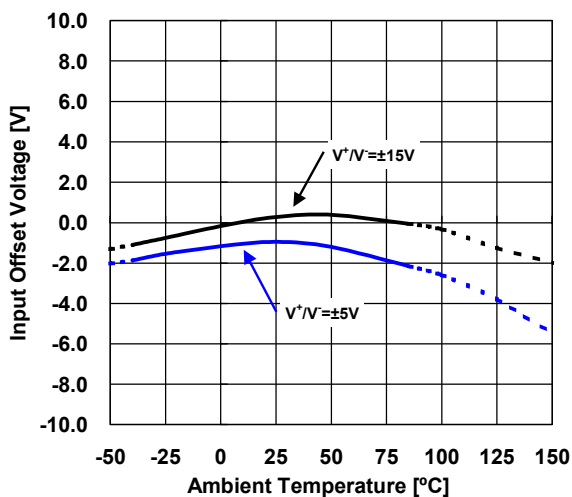
Input Offset Voltage
vs. Common Mode Input Voltage
 $V^+/V^-=\pm 15V$, $T_a=25^\circ C$



Input Offset Voltage
vs. Common Mode Input Voltage
 $V^+/V^-=\pm 5V$, $T_a=25^\circ C$

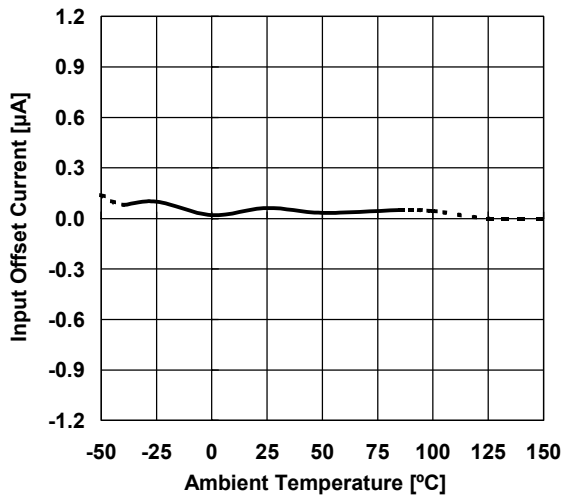


Input Offset Voltage vs. Ambient Temperature
 $V^+/V^-=\pm 5/\pm 15V$

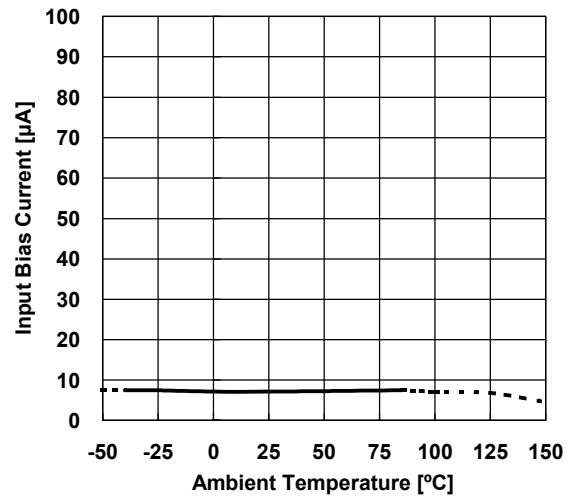


TYPICAL CHARACTERISTICS

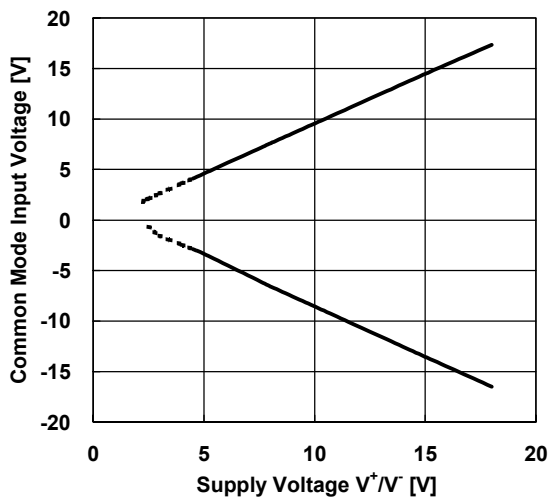
Input Offset Current vs. Ambient Temperature
 $V^+ / V^- = \pm 15V$



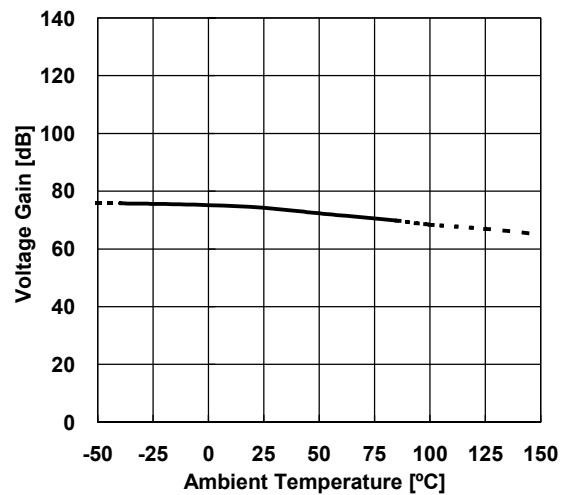
Input Bias Current vs. Ambient Temperature
 $V^+ / V^- = \pm 15V$



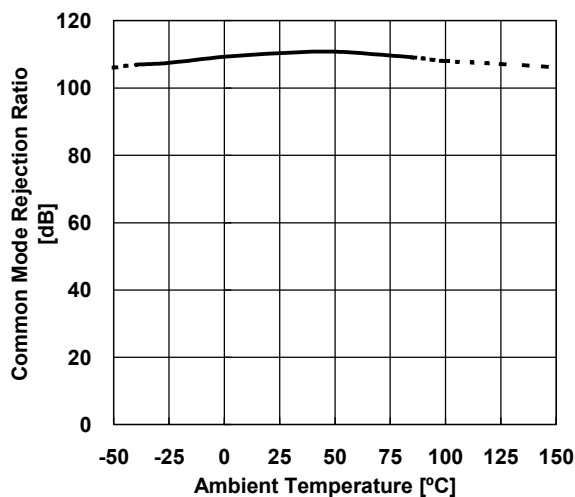
Common Mode Input Voltage vs. Supply Voltage
 $CMR \geq 80dB$, $T_a = 25^\circ C$



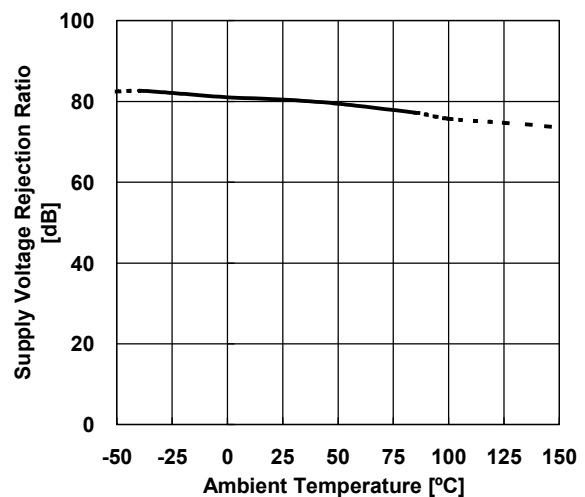
Voltage Gain vs. Ambient Temperature
 $V^+ / V^- = \pm 15V$, $R_L = 2k\Omega$



Common Mode Rejection Ratio vs. Ambient Temperature
 $V^+ / V^- = \pm 15V$, $-15V \leq V_{ICM} \leq +12.5V$

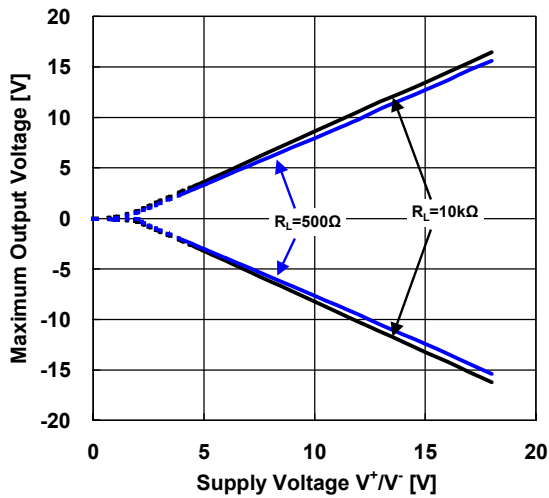


Supply Voltage Rejection Ratio vs. Ambient Temperature
 $V^+ / V^- = \pm 2.5V$ to $\pm 15V$

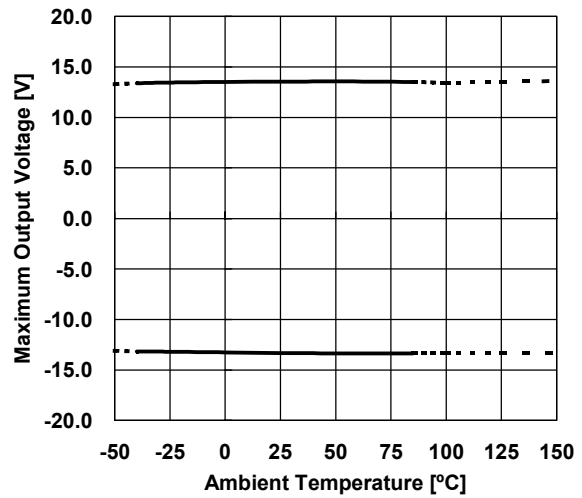


■ TYPICAL CHARACTERISTICS

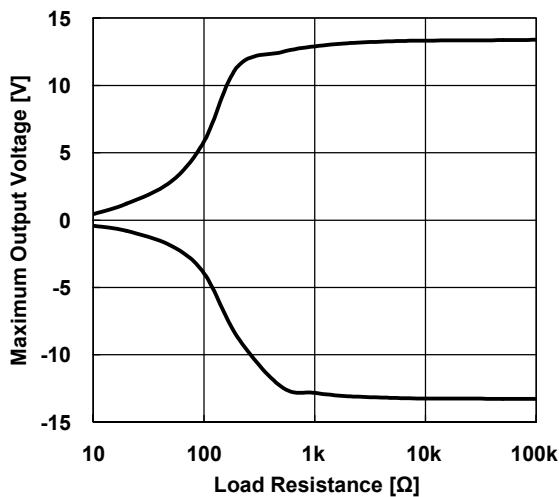
Maximum Output Voltage vs. Supply Voltage
 $T_a=25^\circ\text{C}$



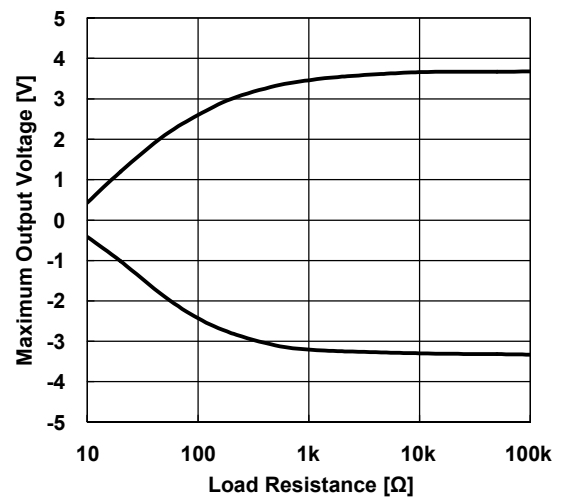
Maximum Output Voltage vs. Ambient Temperature
 $V^+/V^-=\pm 15\text{V}$, $G_v=\text{open}$, $V_{IN}=\pm 1\text{V}$, $R_L=10\text{k}\Omega$



Maximum Output Voltage vs. Load Resistance
 $V^+/V^-=\pm 15\text{V}$, $T_a=25^\circ\text{C}$

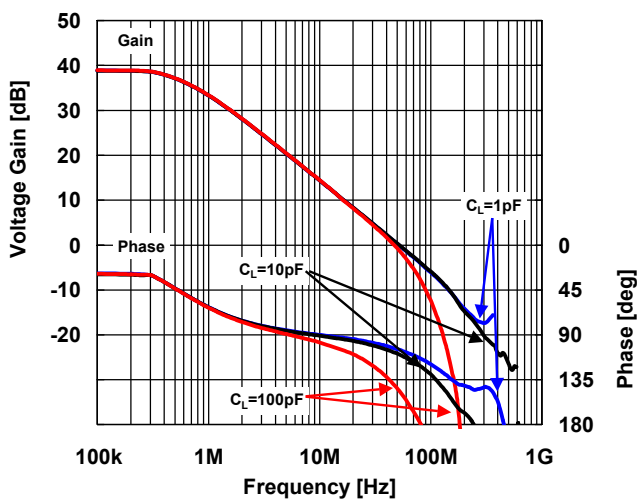


Maximum Output Voltage vs. Load Resistance
 $V^+/V^-=\pm 5\text{V}$, $T_a=25^\circ\text{C}$



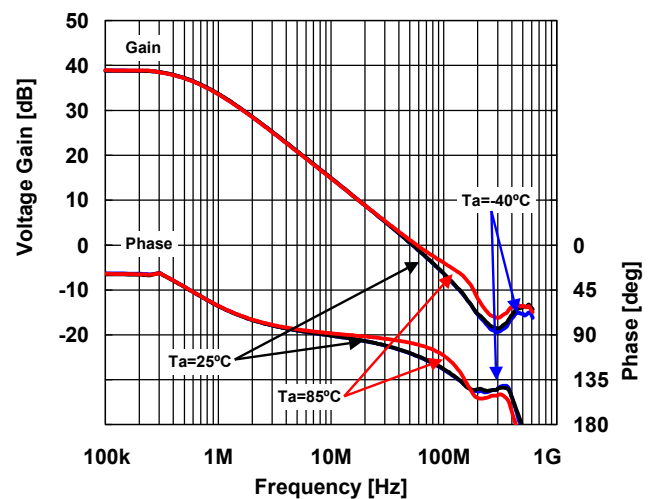
Gain/Phase vs. Frequency (Load Capacitance)

$V^+/V^-=\pm 15\text{V}$, $V_{IN}=0.02\text{V}_{pp}$, $G_v=40\text{dB}$, $R_I=50\Omega$,
 $R_F=1.98\text{k}\Omega$, $R_G=20\Omega$, $C_F=0\text{F}$, $R_L=500\Omega$, $T_a=+25^\circ\text{C}$



Gain/Phase vs. Frequency (Ambient Temperature)

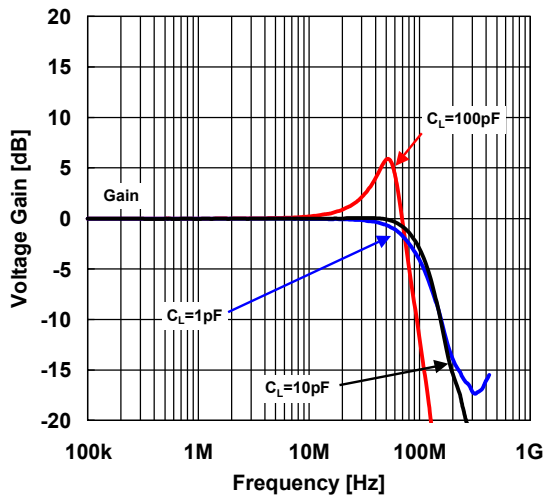
$V^+/V^-=\pm 15\text{V}$, $V_{IN}=0.02\text{V}_{pp}$, $G_v=40\text{dB}$, $R_I=50\Omega$,
 $R_F=1.98\text{k}\Omega$, $R_G=20\Omega$, $C_F=0\text{F}$, $C_L=10\text{pF}$, $R_L=500\Omega$



TYPICAL CHARACTERISTICS

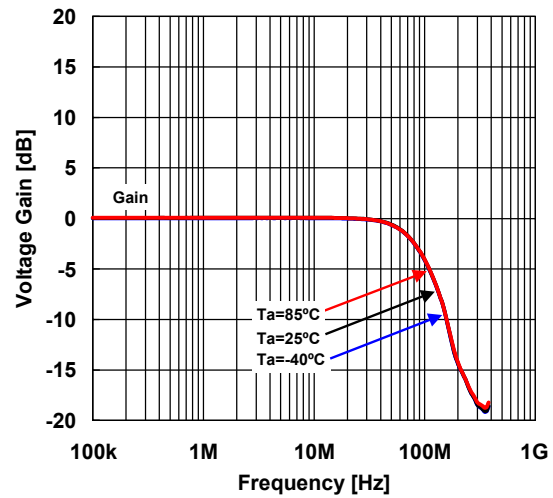
V.F. Peak vs. Frequency (Load Capacitance)

$V^+ / V^- = \pm 15V$, $V_{IN} = 0.02V_{pp}$, $G_V = 0dB$, $R_T = 50\Omega$,
 $R_F = 0\Omega$, $R_G = \text{open}$, $C_F = 0F$, $R_L = 500\Omega$, $T_a = +25^\circ C$



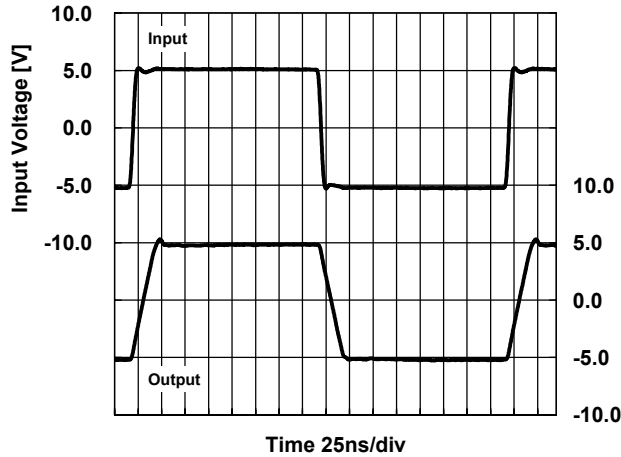
V.F. Peak vs. Frequency (Ambient Temperature)

$V^+ / V^- = \pm 15V$, $V_{IN} = 0.02V_{pp}$, $G_V = 0dB$, $R_T = 50\Omega$,
 $R_F = 0\Omega$, $R_G = \text{open}$, $C_F = 0F$, $C_L = 10pF$, $R_L = 500\Omega$



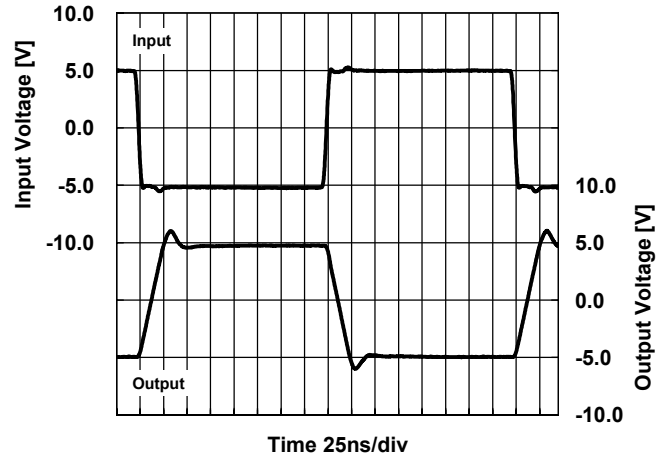
Pulse Response

(Non Inverting Configuration, Large Signal)
 $V^+ / V^- = \pm 15V$, $f = 2.5MHz$, $V_O = 10V_{pp}$, $G_V = 0dB$, $R_T = 50\Omega$,
 $R_F = 0\Omega$, $R_G = \infty$, $R_L = 500\Omega$, $C_L = 10pF$, $T_a = +25^\circ C$



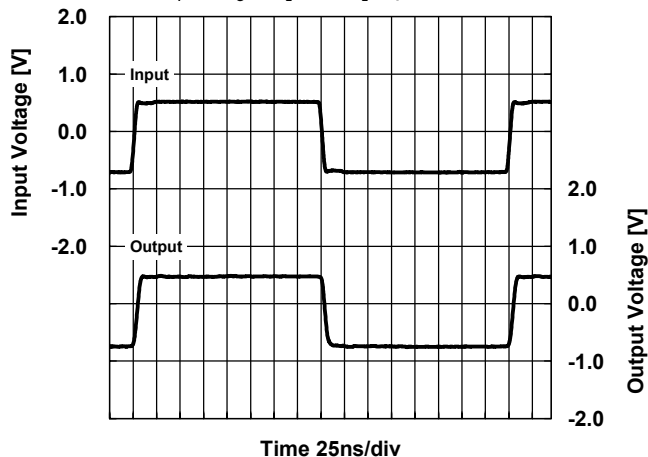
Pulse Response

(Inverting Configuration, Large Signal)
 $V^+ / V^- = \pm 15V$, $f = 2.5MHz$, $V_O = 10V_{pp}$, $G_V = 0dB$, $R_T = 56\Omega$,
 $R_F = 1k\Omega$, $R_G = 1k\Omega$, $R_L = 1k\Omega$, $C_L = 10pF$, $T_a = +25^\circ C$



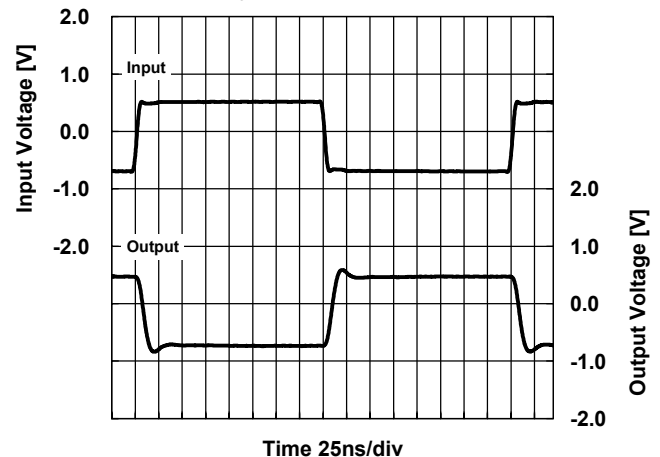
Pulse Response

(Non Inverting Configuration, Small Signal)
 $V^+ / V^- = \pm 15V$, $f = 2.5MHz$, $V_O = 1V_{pp}$, $G_V = 0dB$, $R_T = 50\Omega$,
 $R_F = 0\Omega$, $R_G = \infty$, $R_L = 500\Omega$, $C_L = 10pF$, $T_a = +25^\circ C$



Pulse Response

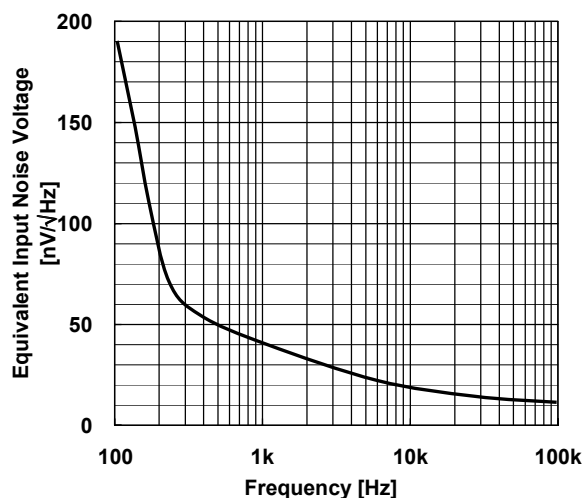
(Inverting Configuration, Small Signal)
 $V^+ / V^- = \pm 15V$, $f = 2.5MHz$, $V_O = 1V_{pp}$, $G_V = 0dB$, $R_T = 56\Omega$,
 $R_F = 1k\Omega$, $R_G = 1k\Omega$, $R_L = 1k\Omega$, $C_L = 10pF$, $T_a = +25^\circ C$



TYPICAL CHARACTERISTICS

Equivalent Input Noise Voltage vs. Frequency

$V^+ / V^- = \pm 15V$, $V_{IN} = 50\Omega$ to GND, $G_V = 40dB$, $R_S = 50\Omega$,
 $R_F = 1.98k$, $R_G = 20\Omega$, $R_L = \infty$, $C_L = 0pF$, $T_a = 25^\circ C$



TEST CIRCUITS

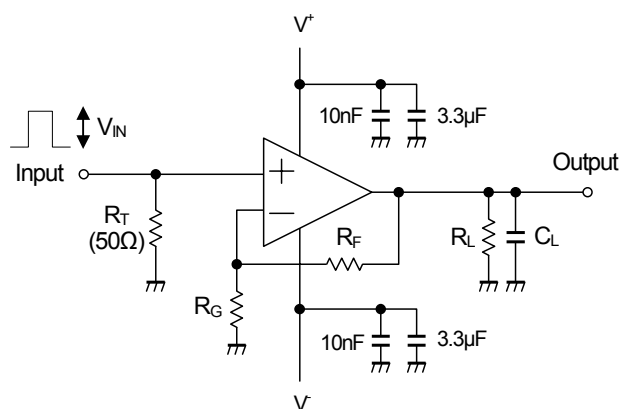


Figure 2 - 1: Slew Rate Test Circuit (Non Inverting)

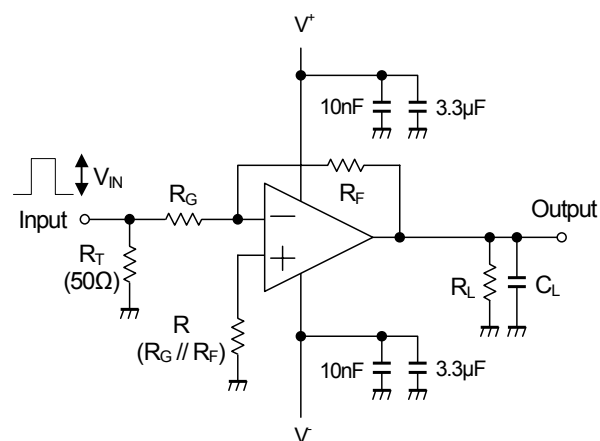


Figure 2 - 2: Slew Rate Test Circuit (Inverting)

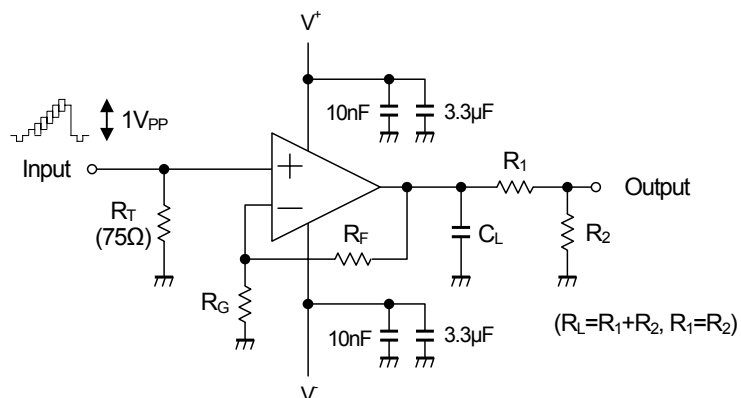


Figure 2 - 3: DG / DP Test Circuit

[CAUTION]

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