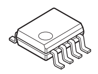
Single-Supply High-Operating voltage Dual Operational Amplifier

■ GENERAL DESCRIPTION

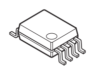
The NJM2718 is a single-supply high voltage dual operational amplifier. It is suitable for high supply voltage applications.

Large-capacitance drive capability is better or equal than competing products.

■PACKAGE OUTLINE



NJM2718E



NJM2718V

■ FEATURES

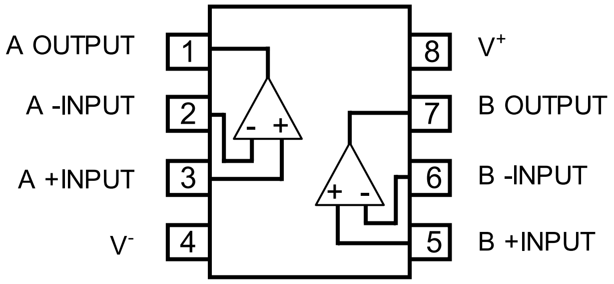
●Single Supply	
●Operating Voltage	3V~36V
●Input Offset Voltage	4mV max.
●Large Capacitance Drive Capability	1000pF typ.
●Output Voltage	V_{OH}≥+13.5V, V_{OL}≤-14.0V (at V^+/V^- = ±15V, R_L=2kΩ)
	V_{OH}≥+3.7V, V_{OL}≤0.3V (at V^+=+5V, R_L=2kΩ)
●Slew Rate	3.5V/µs typ. (at Vin = 1Vpp, R_L=2kΩ)
	9V/µs typ. (at Vin = 20Vpp, R_L=2kΩ)
●Bipolar Technology	
●Package Outline	EMP8, SSOP8

■ APPLICATION

- ●Low-Side Current Sense
- ●PWM Motor Control System
- ●Power Supply Module
- ●Line Driver, ADC/DAC Buffer

■ PIN CONFIGURATION

(Top View)



EMP8 [NJM2718E]
SSOP8 [NJM2718V]

■ ABSOLUTE MAXIMUM RATINGS (Ta=25˚C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+	+40	V
Common Mode Input Voltage Range	V_{ICM}	V^--0.3V to V^++0.3V	V
Differential Input Voltage Range	V_{ID}	±40	V
Output Voltage	V_O	V^--0.3V to V^++0.3V (Note1)	V
Output Sink/Source Current for Each one Output Terminal	I_{OPORT}	±80 (Note3)	mA
Flow in Current for V^+ terminal	I_{IV+}	90 (Note3)	mA
Flow out Current for V^- terminal	I_{OV-}	90 (Note3)	mA
Power Dissipation	P_D	300 [EMP8], 250[SSOP8]	mW
		500[EMP8] (Note2)	mW
		350[SSOP8] (Note2)	mW
Operating Temperature Range	T_{opr}	-40 to +85	˚C
Storage Temperature Range	T_{stg}	-50 to +125	˚C

(Note 1) The output voltage of normal operation will be the Output Voltage Swing of electrical characteristics.

(Note 2) On the PCB " EIA/JEDEC (76.2x114.3x1.6mm, two layers, FR-4) "

(Note 3) Do not exceed "Power dissipation: PD" 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 (Ta) is Ta≥25°C.

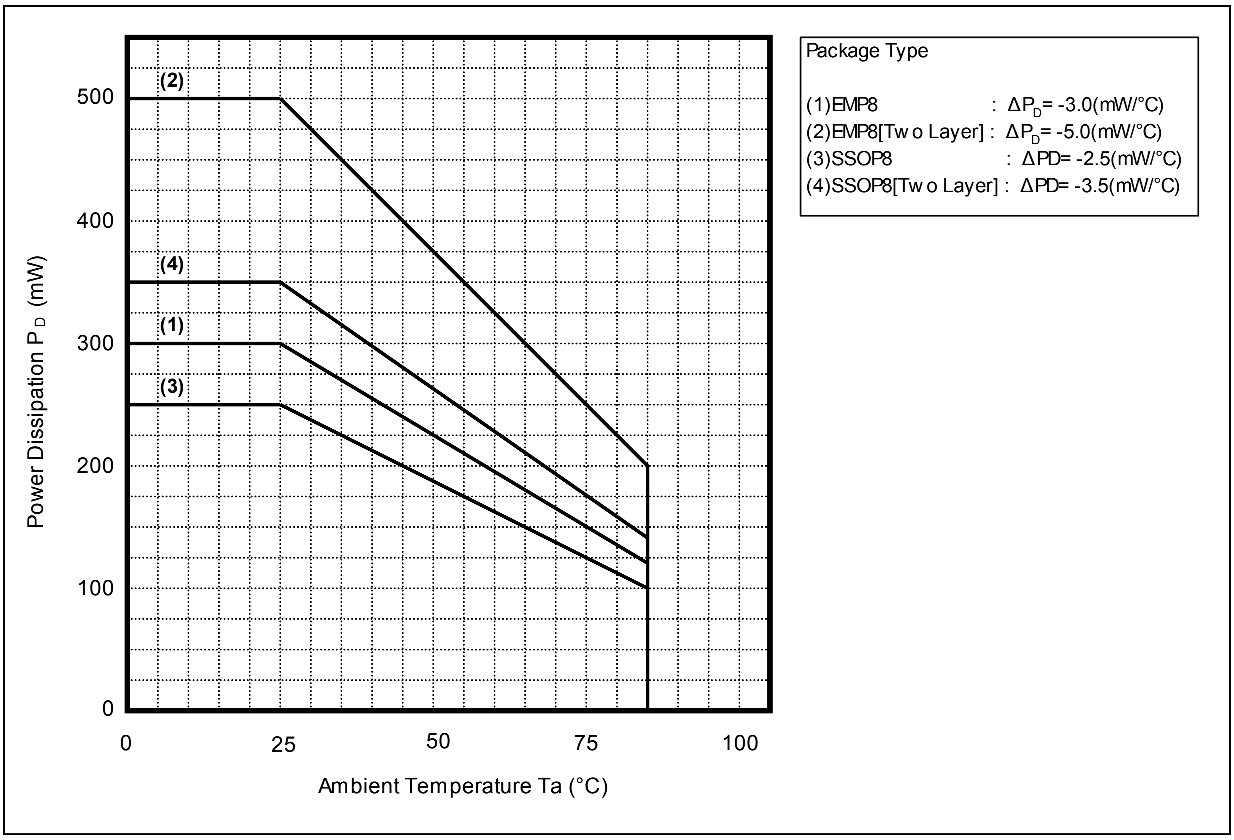


Figure1: Power Dissipation – Ambient Temperature

■ OPERATING VOLTAGE (Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V^+	(Note3)	+3	-	+36	V

■ ELECTRICAL CHARACTERISTICS

●DC CHARACTERISTICS (V^+/V^-=±15V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current	Icc	No Signal	-	3.7	5.3	mA
Input Offset Voltage	V_{IO}	Rs=50Ω	-	1	4	mV
Input Offset Voltage Drift	ΔVio/ΔT	Rs=50Ω	-	10	-	μV/deg
Input Bias Current	I_B	Rs=50Ω	-	1.2	4	μA
Input Offset Current	I_{IO}	Rs=50Ω	-	0.1	1.8	μA
Voltage Gain	Av	R_L≥2kΩ, Vo=±10V, Rs=50Ω	88	100	-	dB
Common Mode Rejection Ratio	CMR	-15V≤ V_{ICM} ≤+13V, Rs=50Ω	70	83	-	dB
Supply Voltage Rejection Ratio	SVR	±1.5V≤ V^+/V^- ≤±18V, Rs=50Ω	70	100	-	dB
Maximum Output Voltage 1	$V_{OH}1$	R_L=10kΩ to 0V	+13.7	+14	-	V
	$V_{OL}1$	R_L=10kΩ to 0V	-	-14.6	-14.2	V
Maximum Output Voltage 2	$V_{OH}2$	R_L=2kΩ to 0V	+13.5	+14.0	-	V
	$V_{OL}2$	R_L=2kΩ to 0V	-	-13.9	-13.5	V
Output Source Current	I source	Vin+=+1V, Vin-=0V, Vo=0V	10	30	-	mA
Output Sink Current	Isink	Vin+=0V, Vin-=+1V, Vo=0V	20	30	-	mA
Common Mode Input Voltage	V_{ICM}	CMR≥70dB	-15	-	+13	V

●AC CHARACTERISTICS (V^+/V^-=±15V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gain Bandwidth Product	GBW	f=100kHz	-	1.8	-	MHz
Power Band1	PBW1	Gv=+1, R_L=2kΩ to 0V, Vo=20Vpp, THD=1%	-	80	-	kHz
Power Band2	PBW2	Gv=+1, R_L=2kΩ to 0V, Vo=2Vpp, THD=1%	-	800	-	kHz
Phase Margin	φM1	R_L=2kΩ to 0V, C_L=0pF	-	85	-	deg
	φM2	R_L=2kΩ to 0V, C_L=300pF	-	75	-	deg
Gain Margin	AM1	R_L=2kΩ to 0V, C_L=0pF	-	18	-	dB
	AM2	R_L=2kΩ to 0V, C_L=300pF	-	11	-	dB
Equivalent Input Noise Voltage	V_{NI}	Rs=50Ω, f=1kHz	-	24	-	nV/√Hz
Total Harmonic Distortion	THD	Gv=+10, R_L=2kΩ to 0V Vo=20Vpp, f=10kHz	-	0.03	-	%
Input Capacitance	ci	V_{ICM}=0V, f=1MHz, Vinpower=0dBm	-	4.5	-	pF
Channel Separation	CT	f=20~20kHz, R_L=2kΩ	-	120	-	dB

●TRANSIENT CHARACTERISTICS (V^+/V^-=±15V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate 1	$SR1_P$	Vin=1Vpp (-0.5V to +0.5V), Gv=+1, R_L=2kΩ to 0V, C_L=500pF	-	3.5	-	V/μs
	$SR1_N$	Vin=1Vpp (-0.5V to +0.5V), Gv=-1, R_L=2kΩ to 0V, C_L=500pF	-	3.5	-	V/μs
Slew Rate 2	$SR2_P$	Vin=20Vpp (-10V to +10V), Gv=+1, R_L=2kΩ to 0V, C_L=500pF	-	9	-	V/μs
	$SR2_N$	Vin=20Vpp (-10V to +10V), Gv=-1, R_L=2kΩ to 0V, C_L=500pF	-	9	-	V/μs
Settling time(0.1%)	ts1	Vin=10Vpp, Gv=-1, Rin=1kΩ, Rf=1kΩ, Rg=5kΩ, C_L=470pF	-	0.9	-	μs
Settling time(0.01%)	ts2		-	1.9	-	μs

■ ELECTRICAL CHARACTERISTICS

●DC CHARACTERISTICS (V^+=+5V, V^-=0V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current	Icc	No Signal	-	2.8	3.5	mA
Input Offset Voltage	V_{IO}	Rs=50Ω	-	1	4	mV
Input Offset Voltage Drift	ΔVio/ΔT	Rs=50Ω	-	10	-	μV/deg
Input Bias Current	I_B	Rs=50Ω	-	1	4	μA
Input Offset Current	I_{IO}	Rs=50Ω	-	0.1	1.8	μA
Voltage Gain	Av	R_L≥2kΩ, Vo=1.5V to 3.5V, Rs=50Ω	80	100	-	dB
Common Mode Rejection Ratio	CMR	0V≤ V_{ICM} ≤3V, Rs=50Ω	65	80	-	dB
Supply Voltage Rejection Ratio	SVR	±1.5V≤ V^+/V^- ≤±2.5V, Rs=50Ω	70	85	-	dB
Maximum Output Voltage 1	V_{OH}1	R_L=2kΩ to 0V	3.7	4	-	V
	V_{OL}1	R_L=2kΩ to 0V	-	0.1	0.2	V
Output Source Current	Isource	Vin+=+1V, Vin-=0V, Vo=+2.5V	10	20	-	mA
Output Sink Current	Isink	Vin+=0V, Vin-=+1V, Vo=+2.5V	20	30	-	mA
Common Mode Input Voltage	V_{ICM}	CMR≥65dB	0	-	3	V

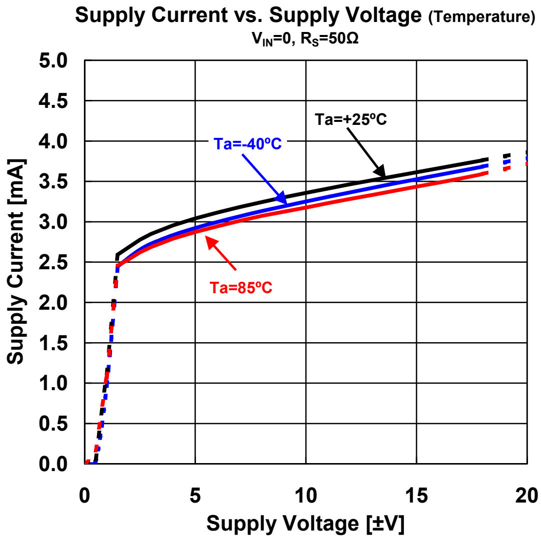
●AC CHARACTERISTICS (V^+=+5V, V^-=0V, Ta=25°C)

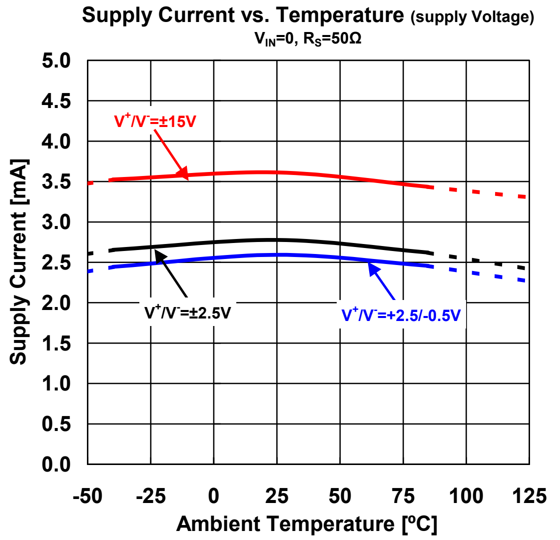
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gain Bandwidth Product	GBW	f=100kHz	-	1.7	-	MHz
Power Band1	PBW1	Gv=+1, R_L=2kΩ to 2.5V, Vo=2Vpp, THD=1%	-	600	-	kHz
Phase Margin	φM1	R_L=2kΩ to 2.5V, C_L=0pF	-	75	-	deg
	φM2	R_L=2kΩ to 2.5V, C_L=300pF	-	70	-	deg
Gain Margin	AM1	R_L=2kΩ to 2.5V, C_L=0pF	-	17	-	dB
	AM2	R_L=2kΩ to 2.5V, C_L=300pF	-	11	-	dB
Equivalent Input Noise Voltage	V_{NI}	Rs=50Ω, f=1kHz	-	24	-	nV/√Hz
Total Harmonic Distortion	THD	Gv=+10, R_L=2kΩ to 2.5V, Vo=3Vpp, f=10kHz	-	0.05	-	%
Input Capacitance	ci	Vcm=0V, f=1MHz, Vinpower=0dBm	-	5	-	pF
Channel Separation	CT	f=10kHz	-	110	-	dB

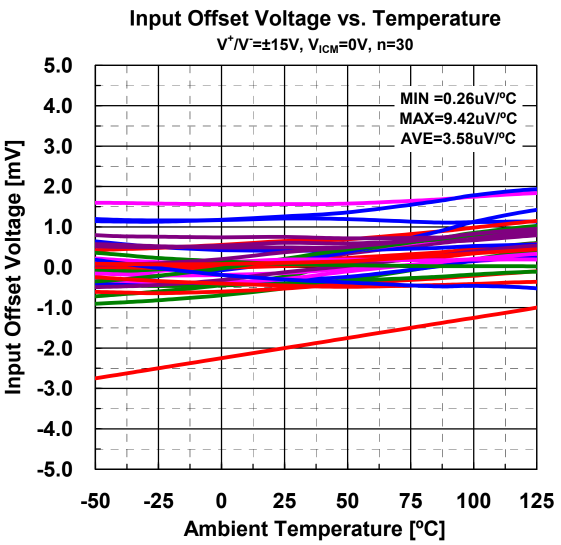
●TRANSIENT CHARACTERISTICS (V^+=+5V, V^-=0V, Ta=25°C)

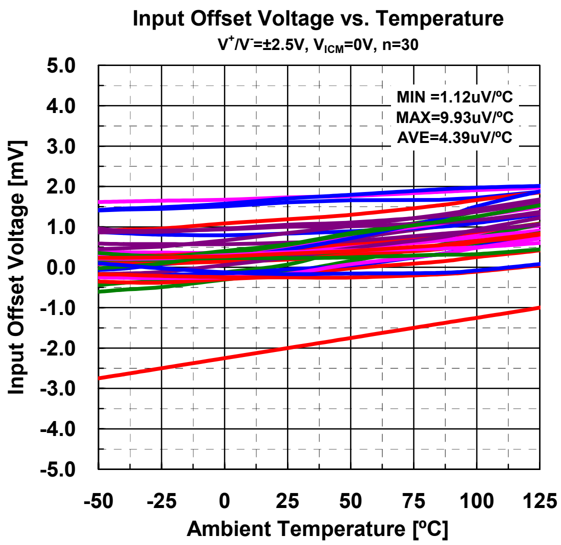
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate 1	$SR1_P$	Vin=1Vpp (+2V to +3V), Gv=+1, R_L=2kΩ to 0V, C_L=500pF	-	3	-	V/μs
	$SR1_N$	Vin=1Vpp (+2V to +3V), Gv=-1, R_L=2kΩ to 0V, C_L=500pF	-	2.5	-	V/μs
Settling time(0.1%)	ts1	Vin=1Vpp, Gv=-1, Rin=1kΩ, Rf=1kΩ, Rg=5kΩ, C_L=470pF	-	1.5	-	μs
Settling time(0.01%)	ts2		-	3	-	μs

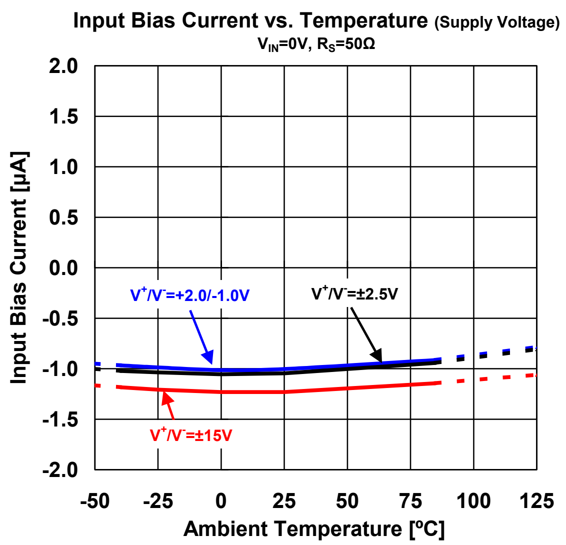
■ TYPICAL CHARACTERISTICS

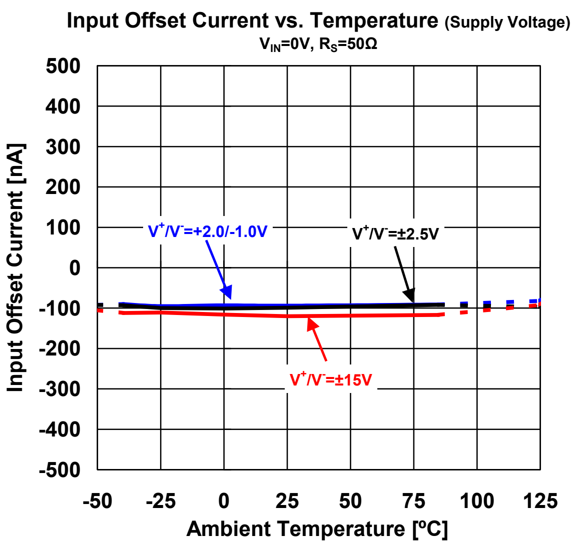






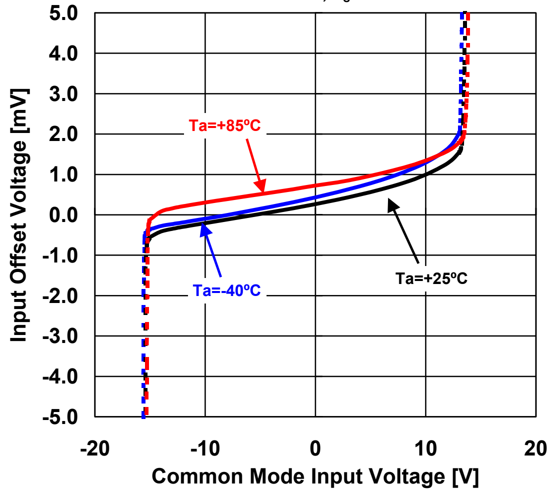




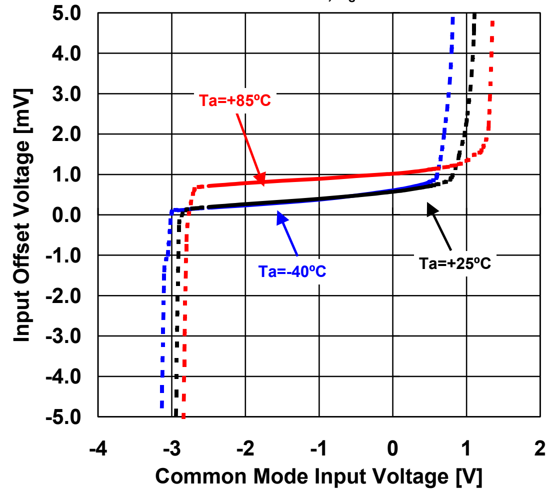


■ TYPICAL CHARACTERISTICS

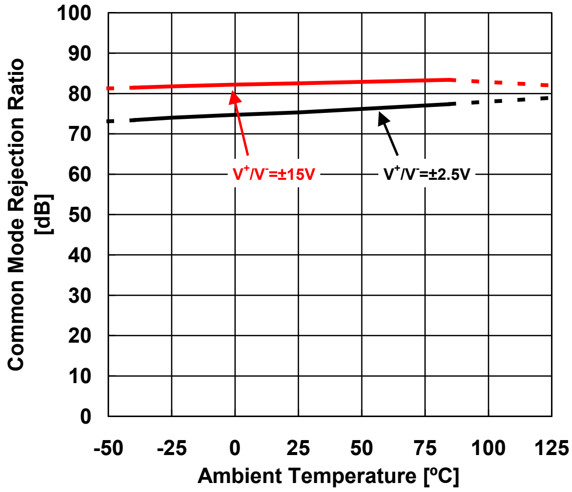
Input Offset Voltage
vs. Common Mode Input Voltage
(Temperature)
$V^+/V^-=\pm15V$, $R_S=50\Omega$



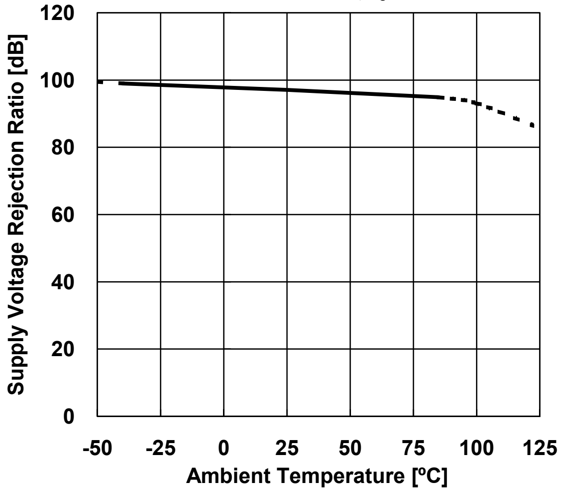
Input Offset Voltage
vs. Common Mode Input Voltage
(Temperature)
$V^+/V^-=\pm2.5V$, $R_S=50\Omega$



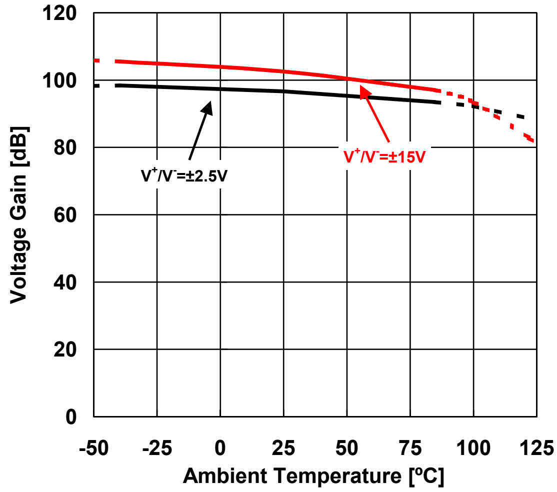
Common Mode Rejection Ratio vs. Temperature
(Supply Voltage)
$R_S=50\Omega$



Supply Voltage Rejection Ratio vs. Temperature
$V^+/V^-=\pm1.5V$ to $\pm18V$, $R_S=50\Omega$



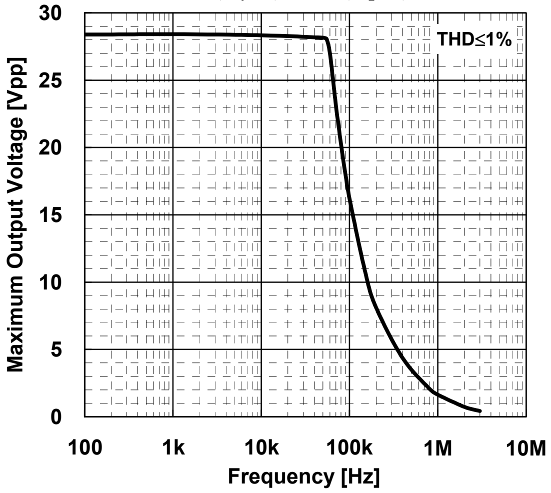
Voltage Gain vs. Temperature (Supply Voltage)
$R_S=50\Omega$, $R_L=2k\Omega$



■ TYPICAL CHARACTERISTICS

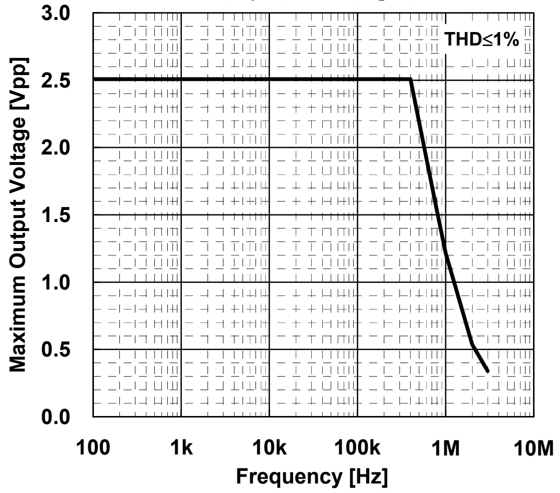
Maximum Output Voltage vs. Frequency

V^+/V^-=±15V, A_V=+1, THD≤1%, R_L=2k, Ta=25ºC



Maximum Output Voltage vs. Frequency

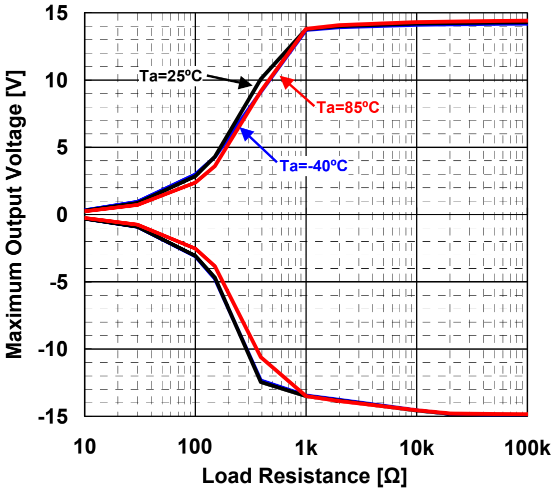
V^+/V^-=±2.5V, A_V=+1, THD≤1%, R_L=2k, Ta=25ºC



Maximum Output Voltage vs. Load Resistance

(Temperature)

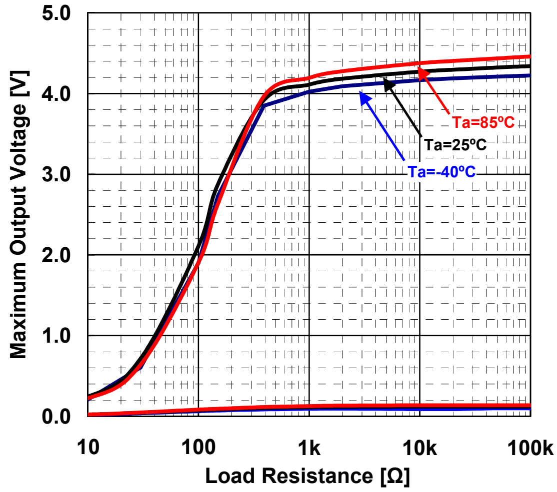
V^+/V^-=±15V, R_L to 0V



Maximum Output Voltage vs. Load Resistance

(Temperature)

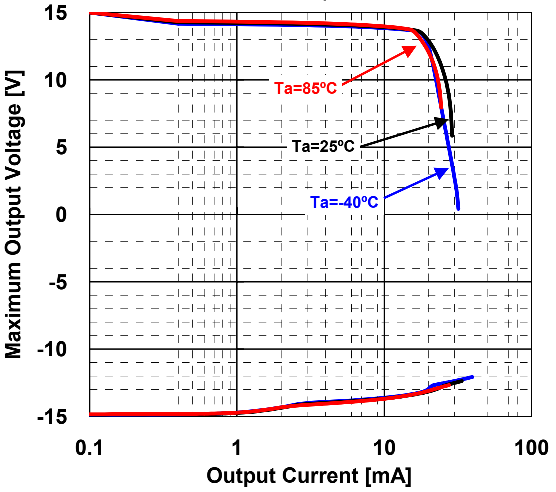
V^+=5V, R_L to 0V



Maximum Output Voltage vs. Output Current

(Temperature)

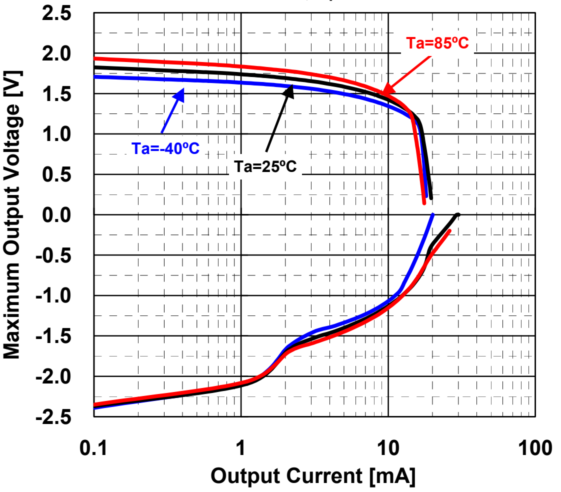
V^+/V^-=±15V, Input=+1/-1V



Maximum Output Voltage vs. Output Current

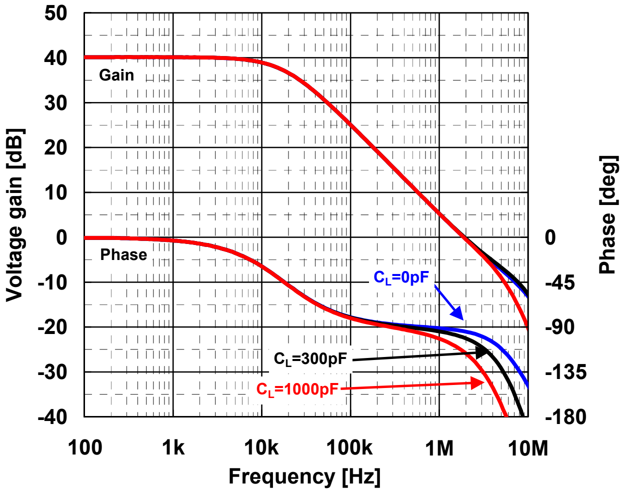
(Temperature)

V^+/V^-=±2.5V, Input=+1/-1V

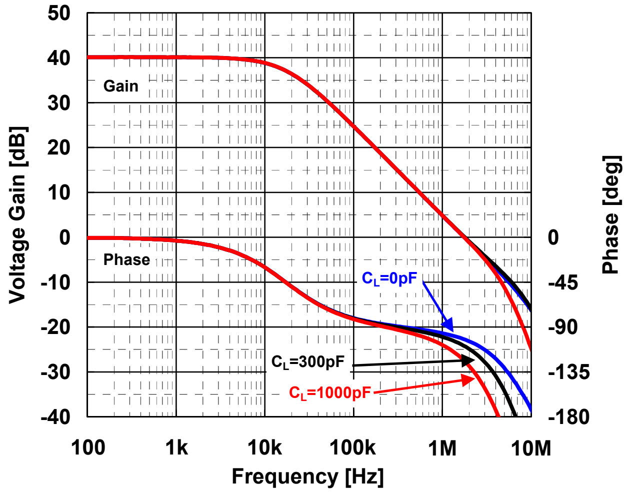


■ TYPICAL CHARACTERISTICS

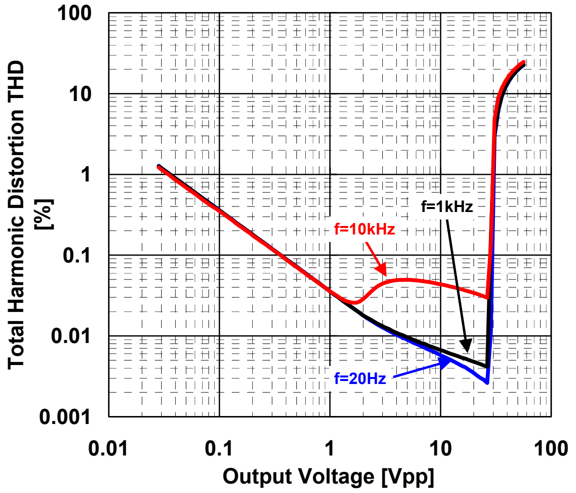
40dB Gain/Phase vs. Frequency (Load Capacitance)
$V^+/V^-=\pm15V$, $V_{IN}=-20dBm$, $R_G=20\Omega$,
$R_F=2k\Omega$, $R_L=2k\Omega$ to 0V, Ta=25ºC



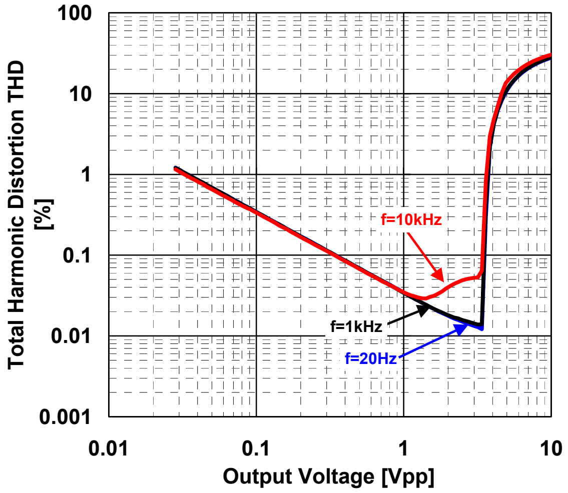
40dB gain/Phase vs. Frequency (Load Capacitance)
$V^+/V^-=\pm2.5V$, $V_{IN}=-20dBm$, $R_G=20\Omega$,
$R_F=2k\Omega$, $R_L=2k\Omega$ to 0V, Ta=25ºC



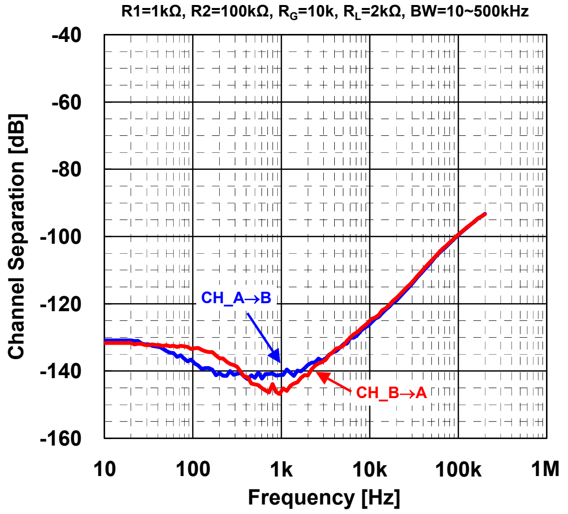
THD vs. Output Voltage (Frequency)
$V^+/V^-=\pm15V$, $V_{IN}=2Vpp$, $A_V=20dB$, $V_O=20Vpp$,
$R1=1k\Omega$, $R2=9k\Omega$, $R_G=1k\Omega$, $R_L=2k\Omega$,
BW=10~500kHz, Ta=25ºC



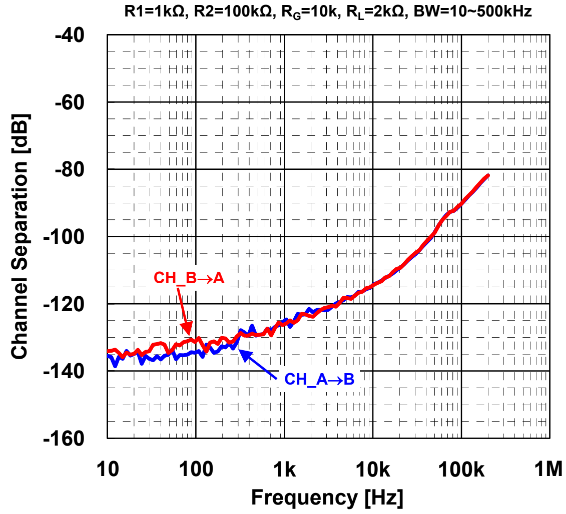
THD vs. Output Voltage (Frequency)
$V^+/V^-=\pm2.5V$, $Z_{IN}=40\Omega$, $A_V=20dB$, $V_O=3Vpp$,
$R1=1k\Omega$, $R2=9k\Omega$, $R_G=10k\Omega$, $R_L=2k\Omega$,
BW=10~500kHz, Ta=25ºC



Channel Separation vs. Frequency
$V^+/V^-=\pm15V$, $V_{IN}=200mVpp$, $Z_{IN}=20\Omega$, $A_V=40dB$, $V_O=20Vpp$,
$R1=1k\Omega$, $R2=100k\Omega$, $R_G=10k$, $R_L=2k\Omega$, BW=10~500kHz

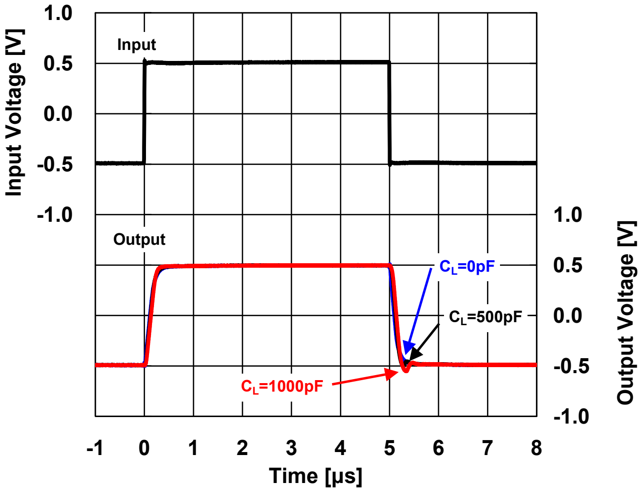


Channel Separation vs. Frequency
$V^+/V^-=\pm2.5V$, $V_{IN}=20mVpp$, $Z_{IN}=20\Omega$, $A_V=40dB$, $V_O=2Vpp$,
$R1=1k\Omega$, $R2=100k\Omega$, $R_G=10k$, $R_L=2k\Omega$, BW=10~500kHz

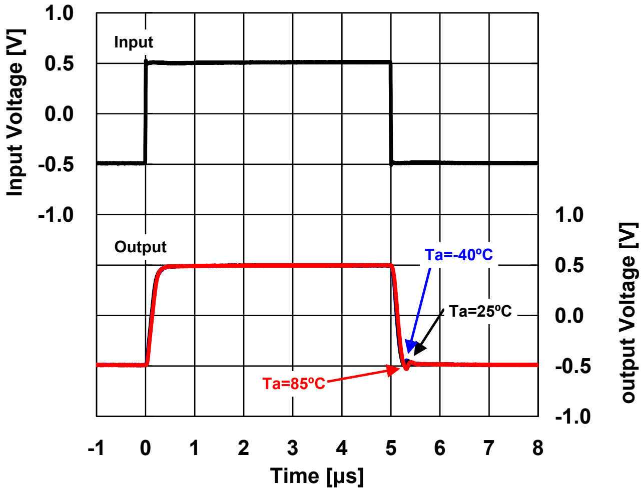


■ TYPICAL CHARACTERISTICS

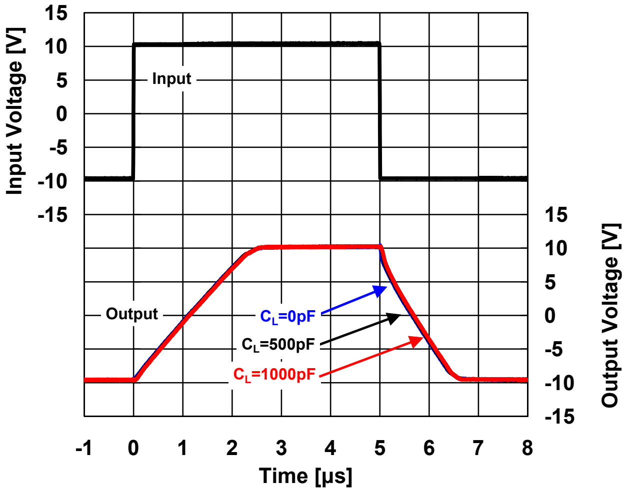
Frequency Response (V_{IN}=1Vpp, Load Capacitance)
V^+/V^-=±15V, V_{IN}=1Vpp,
f=100kHz, A_V=+1, R_L=2kΩ to 0V, Ta=25ºC



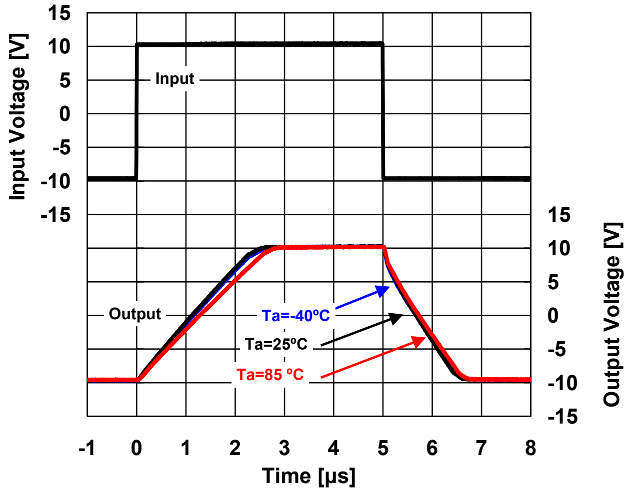
Frequency Response (V_{IN}=1Vpp, Temperature)
V^+/V^-=±15V, V_{IN}=1Vp-p,
f=100kHz, A_V=+1, R_L=2kΩ to 0V, C_L=500pF



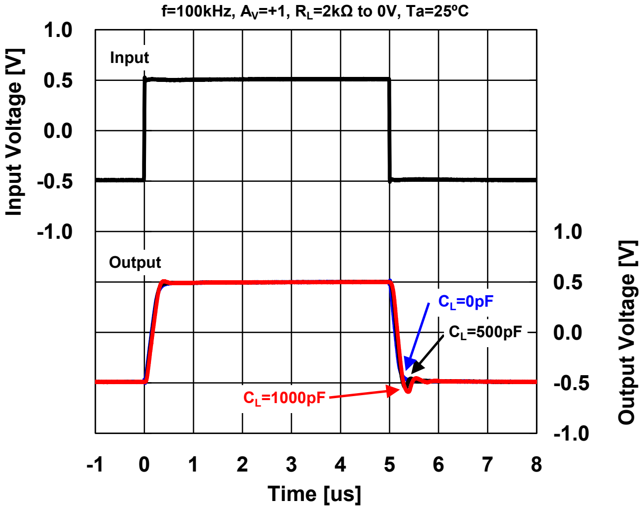
Frequency Response (V_{IN}=20Vpp, Load Capacitance)
V^+/V^-=±15V, V_{IN}=20Vpp,
f=100kHz, A_V=+1, R_L=2kΩ to 0V, Ta=25ºC,



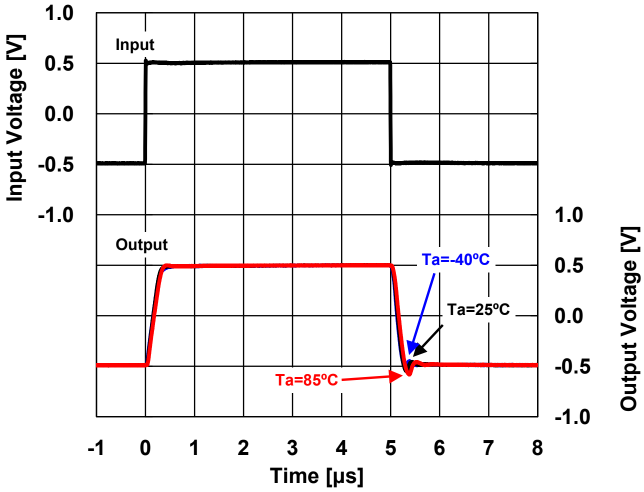
Frequency Response (V_{IN}=20Vpp, Temperature)
V^+/V^-=±15V, V_{IN}=20Vpp,
f=100kHz, A_V=+1, R_L=2kΩ to 0V, C_L=500pF



Frequency Response (V_{IN}=1Vpp, Load Capacitance)
V^+/V^-=±2.5V, V_{IN}=1Vpp,
f=100kHz, A_V=+1, R_L=2kΩ to 0V, Ta=25ºC

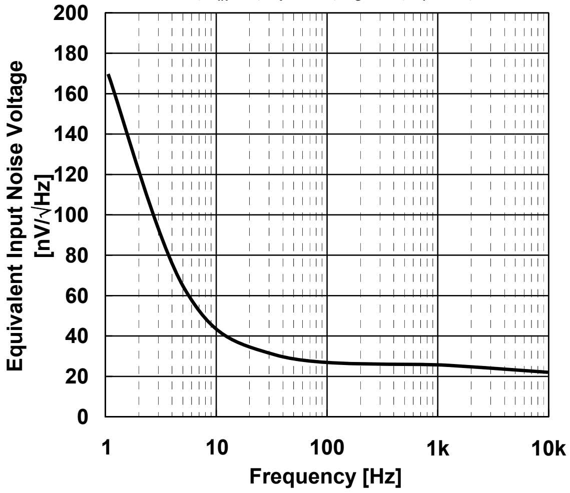


Frequency Response (V_{IN}=1Vpp, Temperature)
V^+/V^-=±2.5V, V_{IN}=1Vpp,
f=100kHz, A_V=+1, R_L=2kΩ to 0V, C_L=500pF

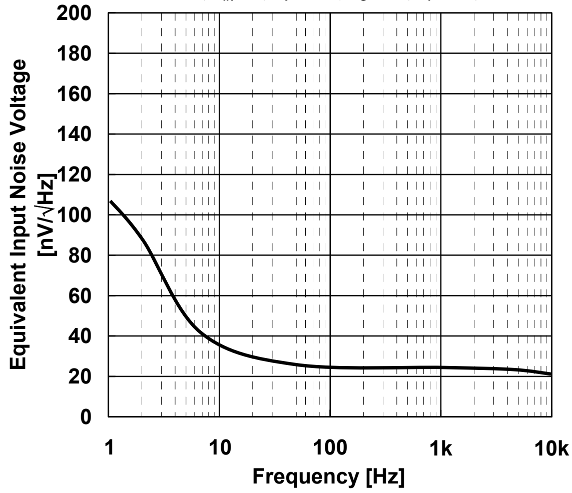


■ TYPICAL CHARACTERISTICS

Equivalent Input Noise Voltage vs. Frequency
V^+/V^-=±15V, V_{IN}=0V, A_V=40dB, R_G=20Ω, R_F=2kΩ, Ta=25ºC



Equivalent Input Noise Voltage vs. Frequency
V^+/V^-=±2.5V, V_{IN}=0V, A_V=40dB, R_G=20Ω, R_F=2kΩ, Ta=25ºC



■ TEST CIRCUIT

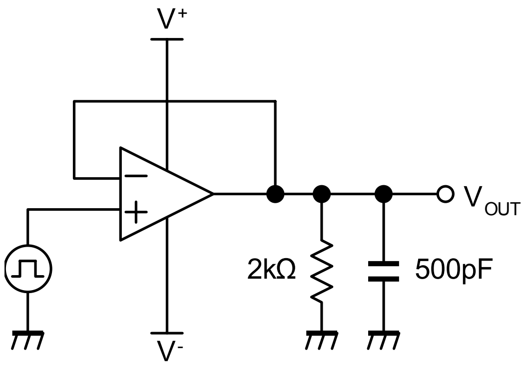


Fig.2.1 Slew Rate (Non Inverting)

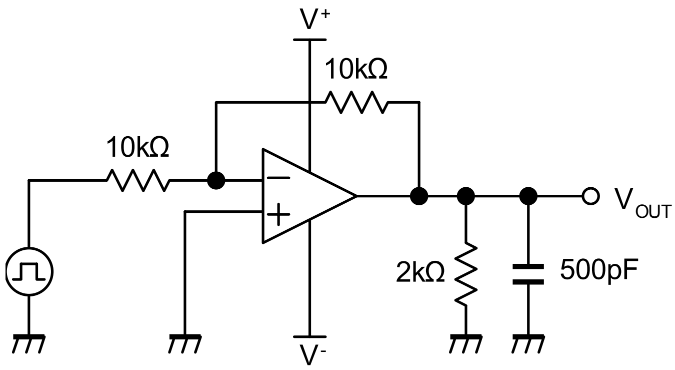


Fig.2.2 Slew Rate (Inverting)

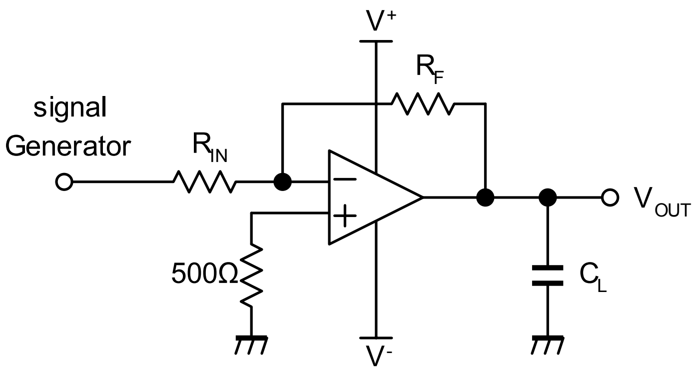


Fig.2.3 Settling Time

[CAUTION]
The specifications on this data book are only given for information, without any guarantee as regards either mistakes or omissions. The application circuits in this data book are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.