

Single-Supply High-Operating voltage Dual Operational Amplifier

■ GENERAL DESCRIPTION

The NJM2718 is a single-supply high-operating 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
(SOP8)



NJM2718V
(SSOP8)

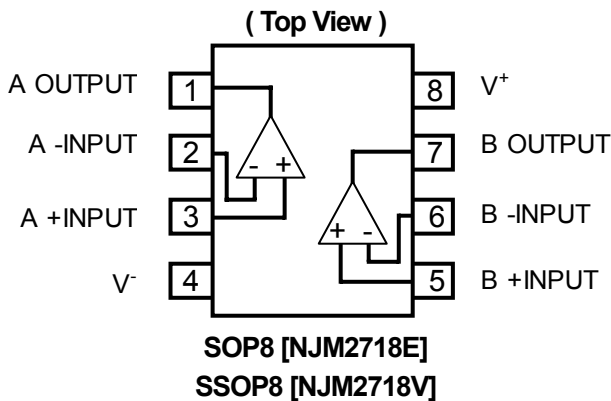
■ FEATURES

- Single Supply
- Operating Voltage 3V~36V
- Input Offset Voltage 4mV max.
- Large Capacitance Drive Capability 1000pF typ.
- Output Voltage $V_{OH} \geq +13.5V$, $V_{OL} \leq -14.0V$ (at $V^+ / V^- = \pm 15V$, $R_L = 2k\Omega$)
 $V_{OH} \geq +3.7V$, $V_{OL} \leq 0.3V$ (at $V^+ = +5V$, $R_L = 2k\Omega$)
- Slew Rate 3.5V/ μ s typ. (at $V_{in} = 1V_{pp}$, $R_L = 2k\Omega$)
 9V/ μ s typ. (at $V_{in} = 20V_{pp}$, $R_L = 2k\Omega$)
- Bipolar Technology
- Package Outline SOP8 JEDEC 150mil , SSOP8

■ APPLICATION

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

■ PIN CONFIGURATION



NJM2718

■ 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 _{V+}	90 (Note3)	mA
Flow out Current for V ⁻ terminal	I _{Ov-}	90 (Note3)	mA
Power Dissipation	P _D	300 [SOP8], 250[SSOP8]	mW
		500[SOP8] (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.

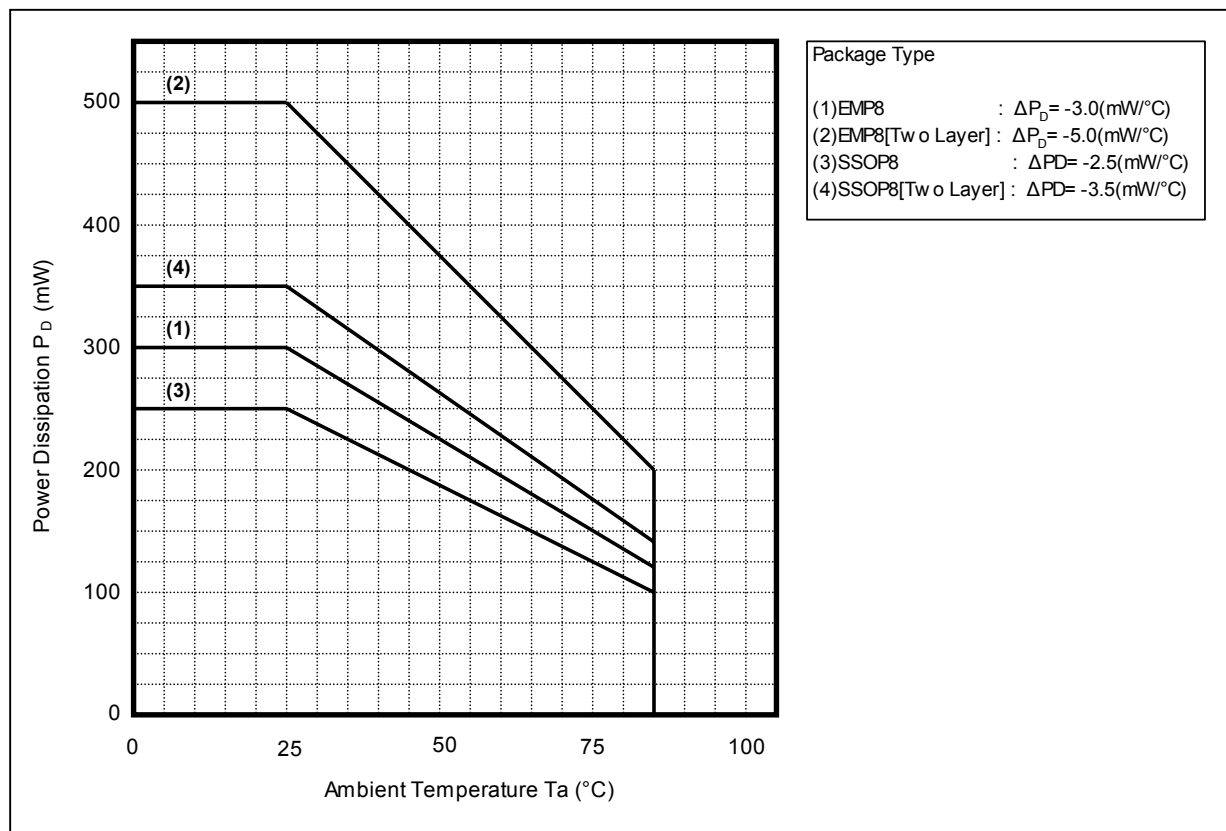


Figure1: Power Dissipation – Ambient Temperature

■ OPERATING VOLTAGE

(Ta=25°C)

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

■ ELECTRICAL CHARACTERISTICS

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

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current	I_{CC}	No Signal	-	3.7	5.3	mA
Input Offset Voltage	V_{IO}	$R_s = 50\Omega$	-	1	4	mV
Input Offset Voltage Drift	$\Delta V_{IO}/\Delta T$	$R_s = 50\Omega$	-	10	-	$\mu V/deg$
Input Bias Current	I_B	$R_s = 50\Omega$	-	1.2	4	μA
Input Offset Current	I_{IO}	$R_s = 50\Omega$	-	0.1	1.8	μA
Voltage Gain	A_v	$R_L \geq 2k\Omega$, $V_o = \pm 10V$, $R_s = 50\Omega$	88	100	-	dB
Common Mode Rejection Ratio	CMR	$-15V \leq V_{ICM} \leq +13V$, $R_s = 50\Omega$	70	83	-	dB
Supply Voltage Rejection Ratio	SVR	$\pm 1.5V \leq V^+V^- \leq \pm 18V$, $R_s = 50\Omega$	70	100	-	dB
Maximum Output Voltage 1	V_{OH1}	$R_L = 10k\Omega$ to 0V	+13.7	+14	-	V
	V_{OL1}	$R_L = 10k\Omega$ to 0V	-	-14.6	-14.2	V
Maximum Output Voltage 2	V_{OH2}	$R_L = 2k\Omega$ to 0V	+13.5	+14.0	-	V
	V_{OL2}	$R_L = 2k\Omega$ to 0V	-	-13.9	-13.5	V
Output Source Current	I_{source}	$V_{in+} = +1V$, $V_{in-} = 0V$, $V_o = 0V$	10	30	-	mA
Output Sink Current	I_{sink}	$V_{in+} = 0V$, $V_{in-} = +1V$, $V_o = 0V$	20	30	-	mA
Common Mode Input Voltage	V_{ICM}	CMR ≥ 70 dB	-15	-	+13	V

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

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gain Bandwidth Product	GBW	$f = 100kHz$	-	1.8	-	MHz
Power Band1	PBW1	$G_v = +1$, $R_L = 2k\Omega$ to 0V, $V_o = 20V_{pp}$, THD=1%	-	80	-	kHz
Power Band2	PBW2	$G_v = +1$, $R_L = 2k\Omega$ to 0V, $V_o = 2V_{pp}$, THD=1%	-	800	-	kHz
Phase Margin	ϕ_{M1}	$R_L = 2k\Omega$ to 0V, $C_L = 0pF$	-	85	-	deg
	ϕ_{M2}	$R_L = 2k\Omega$ to 0V, $C_L = 300pF$	-	75	-	deg
Gain Margin	AM1	$R_L = 2k\Omega$ to 0V, $C_L = 0pF$	-	18	-	dB
	AM2	$R_L = 2k\Omega$ to 0V, $C_L = 300pF$	-	11	-	dB
Equivalent Input Noise Voltage	V_{NI}	$R_s = 50\Omega$, $f = 1kHz$	-	24	-	nV/\sqrt{Hz}
Total Harmonic Distortion	THD	$G_v = +10$, $R_L = 2k\Omega$ to 0V $V_o = 20V_{pp}$, $f = 10kHz$	-	0.03	-	%
Input Capacitance	c_i	$V_{ICM} = 0V$, $f = 1MHz$, $V_{inpower} = 0dBm$	-	4.5	-	pF
Channel Separation	CT	$f = 20 \sim 20kHz$, $R_L = 2k\Omega$	-	120	-	dB

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

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate 1	SR1P	$V_{in} = 1V_{pp}$ (-0.5V to +0.5V), $G_v = +1$, $R_L = 2k\Omega$ to 0V, $C_L = 500pF$	-	3.5	-	$V/\mu s$
	SR1N	$V_{in} = 1V_{pp}$ (-0.5V to +0.5V), $G_v = -1$, $R_L = 2k\Omega$ to 0V, $C_L = 500pF$	-	3.5	-	$V/\mu s$
Slew Rate 2	SR2P	$V_{in} = 20V_{pp}$ (-10V to +10V), $G_v = +1$, $R_L = 2k\Omega$ to 0V, $C_L = 500pF$	-	9	-	$V/\mu s$
	SR2N	$V_{in} = 20V_{pp}$ (-10V to +10V), $G_v = -1$, $R_L = 2k\Omega$ to 0V, $C_L = 500pF$	-	9	-	$V/\mu s$
Settling time(0.1%)	$ts1$	$V_{in} = 10V_{pp}$, $G_v = -1$, $R_{in} = 1k\Omega$, $R_f = 1k\Omega$, $R_g = 5k\Omega$, $C_L = 470pF$	-	0.9	-	μs
Settling time(0.01%)	$ts2$	$V_{in} = 10V_{pp}$, $G_v = -1$, $R_{in} = 1k\Omega$, $R_f = 1k\Omega$, $R_g = 5k\Omega$, $C_L = 470pF$	-	1.9	-	μs

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■ ELECTRICAL CHARACTERISTICS

●DC CHARACTERISTICS ($V^+=+5V$, $V^-=0V$, $T_a=25^\circ C$)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current	I_{CC}	No Signal	-	2.8	3.5	mA
Input Offset Voltage	V_{IO}	$R_s=50\Omega$	-	1	4	mV
Input Offset Voltage Drift	$\Delta V_{IO}/\Delta T$	$R_s=50\Omega$	-	10	-	$\mu V/deg$
Input Bias Current	I_B	$R_s=50\Omega$	-	1	4	μA
Input Offset Current	I_{IO}	$R_s=50\Omega$	-	0.1	1.8	μA
Voltage Gain	A_v	$R_L \geq 2k\Omega$, $V_o=1.5V$ to $3.5V$, $R_s=50\Omega$	80	100	-	dB
Common Mode Rejection Ratio	CMR	$0V \leq V_{ICM} \leq 3V$, $R_s=50\Omega$	65	80	-	dB
Supply Voltage Rejection Ratio	SVR	$\pm 1.5V \leq V^+ / V^- \leq \pm 2.5V$, $R_s=50\Omega$	70	85	-	dB
Maximum Output Voltage 1	V_{OH1}	$R_L=2k\Omega$ to $0V$	3.7	4	-	V
	V_{OL1}	$R_L=2k\Omega$ to $0V$	-	0.1	0.2	V
Output Source Current	I_{source}	$V_{in}=+1V$, $V_{in}=0V$, $V_o=+2.5V$	10	20	-	mA
Output Sink Current	I_{sink}	$V_{in}=0V$, $V_{in}=+1V$, $V_o=+2.5V$	20	30	-	mA
Common Mode Input Voltage	V_{ICM}	CMR ≥ 65 dB	0	-	3	V

●AC CHARACTERISTICS ($V^+=+5V$, $V^-=0V$, $T_a=25^\circ C$)

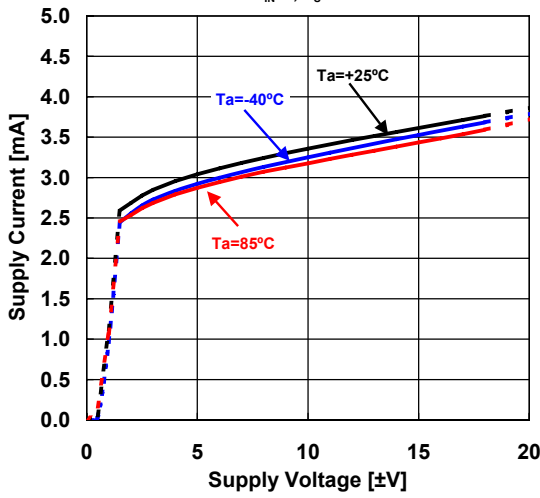
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gain Bandwidth Product	GBW	$f=100kHz$	-	1.7	-	MHz
Power Band1	PBW1	$G_v=+1$, $R_L=2k\Omega$ to $2.5V$, $V_o=2V_{pp}$, THD=1%	-	600	-	kHz
Phase Margin	$\phi M1$	$R_L=2k\Omega$ to $2.5V$, $C_L=0pF$	-	75	-	deg
	$\phi M2$	$R_L=2k\Omega$ to $2.5V$, $C_L=300pF$	-	70	-	deg
Gain Margin	AM1	$R_L=2k\Omega$ to $2.5V$, $C_L=0pF$	-	17	-	dB
	AM2	$R_L=2k\Omega$ to $2.5V$, $C_L=300pF$	-	11	-	dB
Equivalent Input Noise Voltage	V_{NI}	$R_s=50\Omega$, $f=1kHz$	-	24	-	nV/\sqrt{Hz}
Total Harmonic Distortion	THD	$G_v=+10$, $R_L=2k\Omega$ to $2.5V$, $V_o=3V_{pp}$, $f=10kHz$	-	0.05	-	%
Input Capacitance	c_i	$V_{cm}=0V$, $f=1MHz$, $V_{inpower}=0dBm$	-	5	-	pF
Channel Separation	CT	$f=10kHz$	-	110	-	dB

●TRANSIENT CHARACTERISTICS ($V^+=+5V$, $V^-=0V$, $T_a=25^\circ C$)

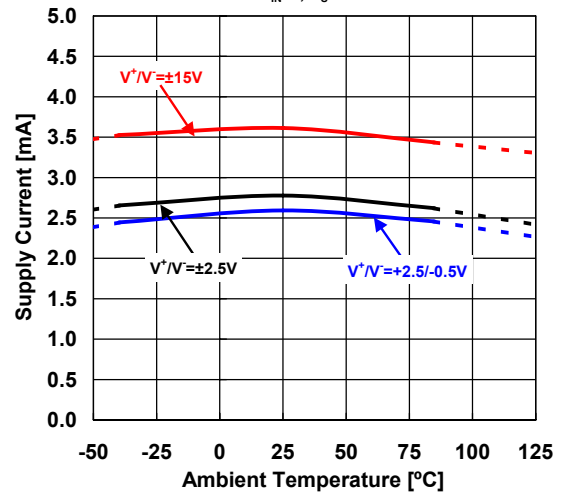
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate 1	$SR1_P$	$V_{in}=1V_{pp}$ (+2V to +3V), $G_v=+1$, $R_L=2k\Omega$ to $0V$, $C_L=500pF$	-	3	-	$V/\mu s$
	$SR1_N$	$V_{in}=1V_{pp}$ (+2V to +3V), $G_v=-1$, $R_L=2k\Omega$ to $0V$, $C_L=500pF$	-	2.5	-	$V/\mu s$
Settling time(0.1%)	$ts1$	$V_{in}=1V_{pp}$, $G_v=-1$, $R_{in}=1k\Omega$, $R_f=1k\Omega$, $R_g=5k\Omega$, $C_L=470pF$	-	1.5	-	μs
Settling time(0.01%)	$ts2$	$V_{in}=1V_{pp}$, $G_v=-1$, $R_{in}=1k\Omega$, $R_f=1k\Omega$, $R_g=5k\Omega$, $C_L=470pF$	-	3	-	μs

■ TYPICAL CHARACTERISTICS

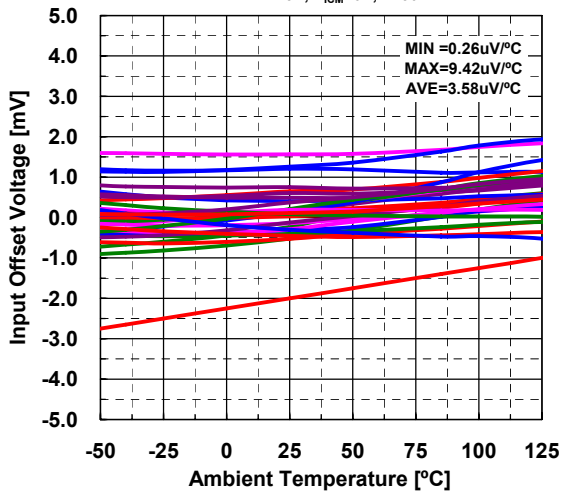
Supply Current vs. Supply Voltage (Temperature)
 $V_{IN}=0, R_S=50\Omega$



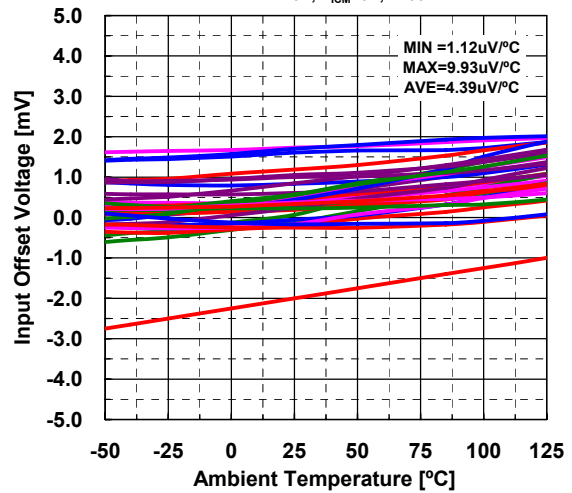
Supply Current vs. Temperature (supply Voltage)
 $V_{IN}=0, R_S=50\Omega$



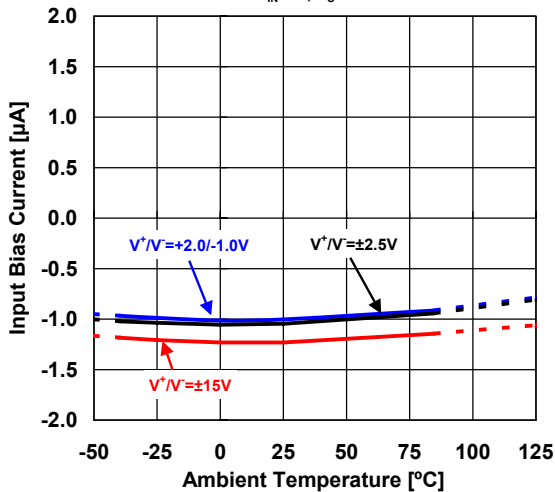
Input Offset Voltage vs. Temperature
 $V^+V^-=\pm 15\text{V}, V_{ICM}=0\text{V}, n=30$



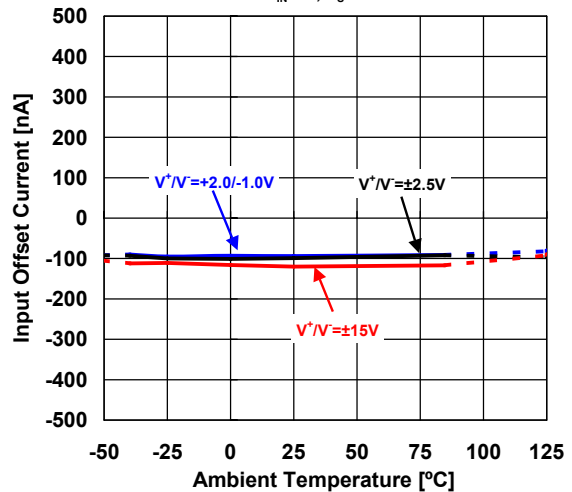
Input Offset Voltage vs. Temperature
 $V^+V^-=\pm 2.5\text{V}, V_{ICM}=0\text{V}, n=30$



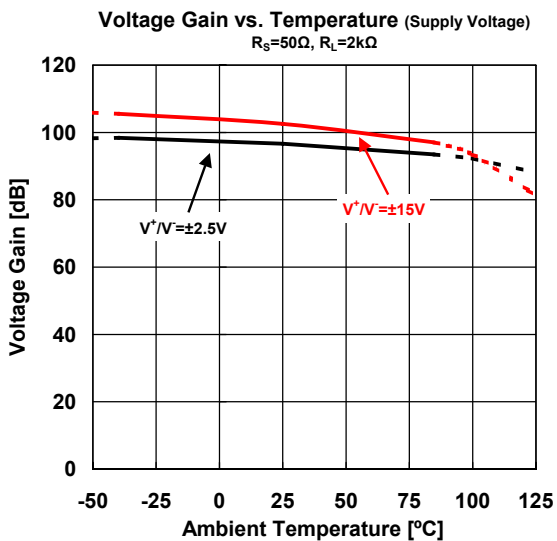
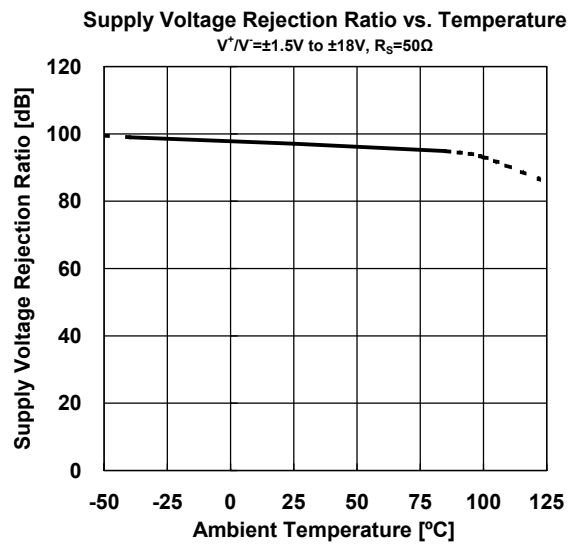
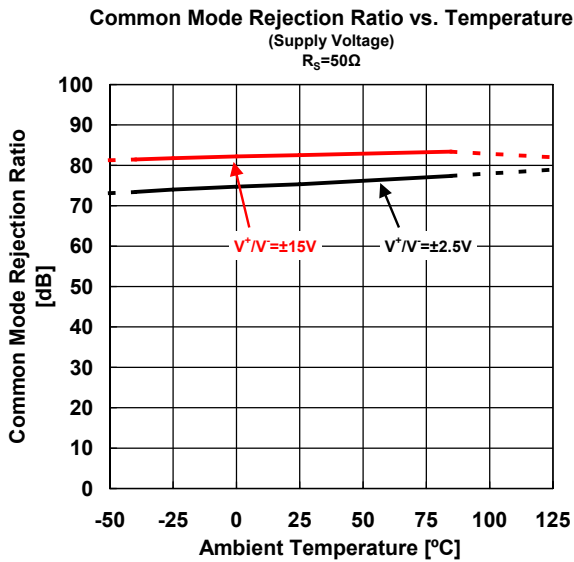
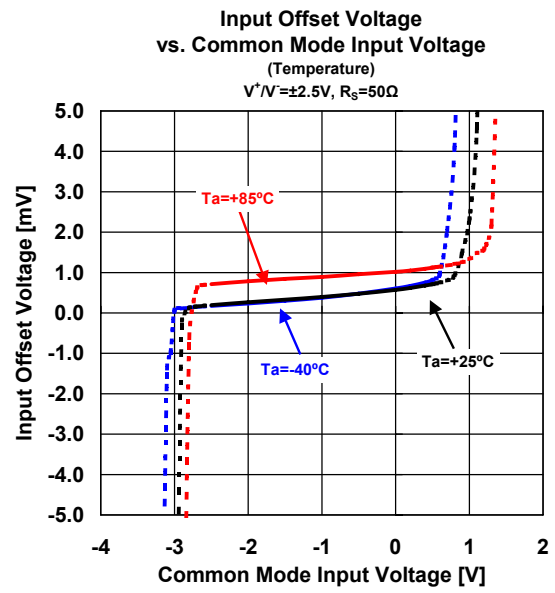
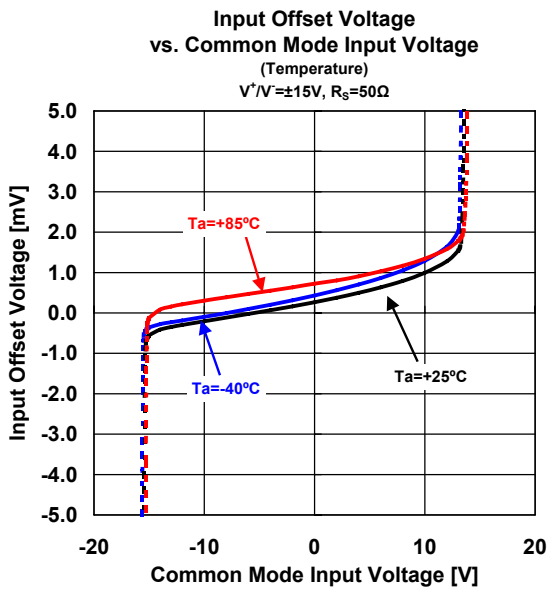
Input Bias Current vs. Temperature (Supply Voltage)
 $V_{IN}=0\text{V}, R_S=50\Omega$



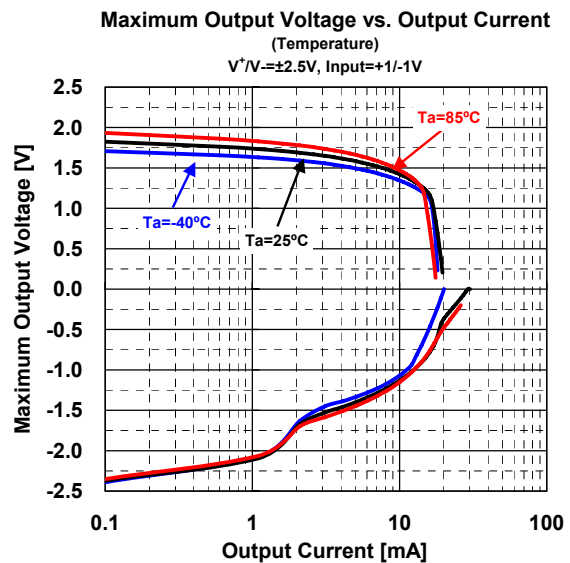
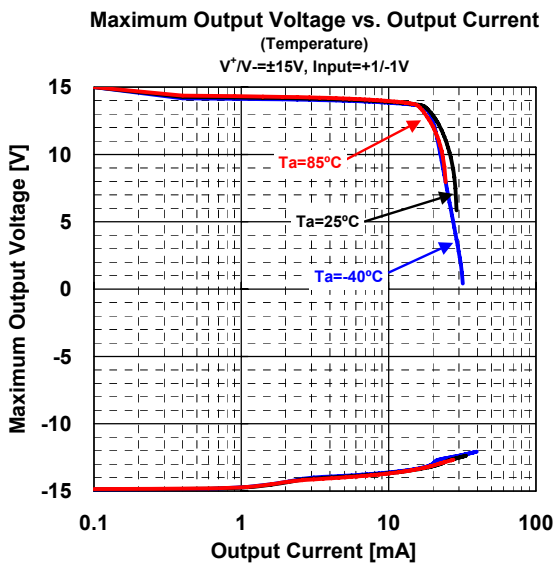
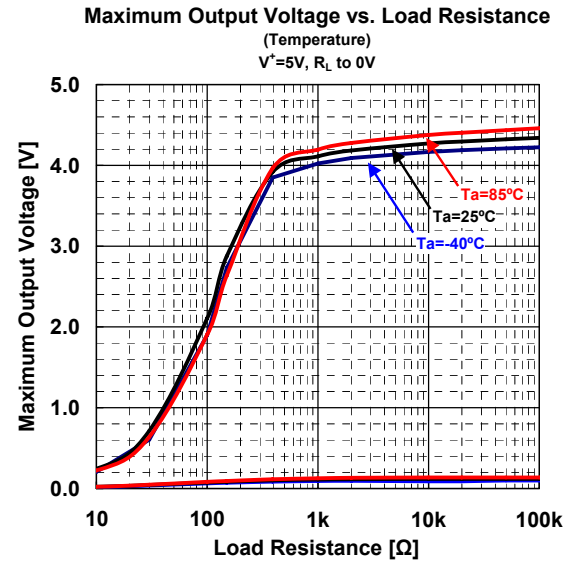
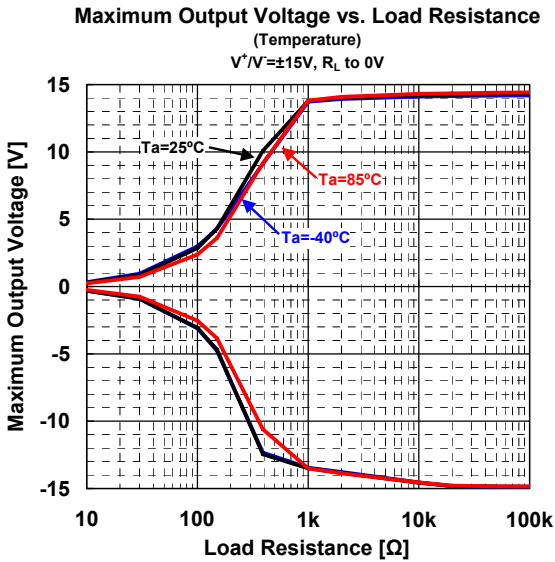
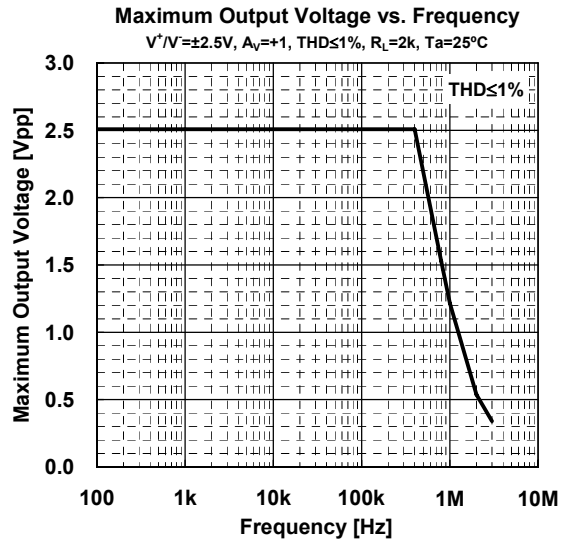
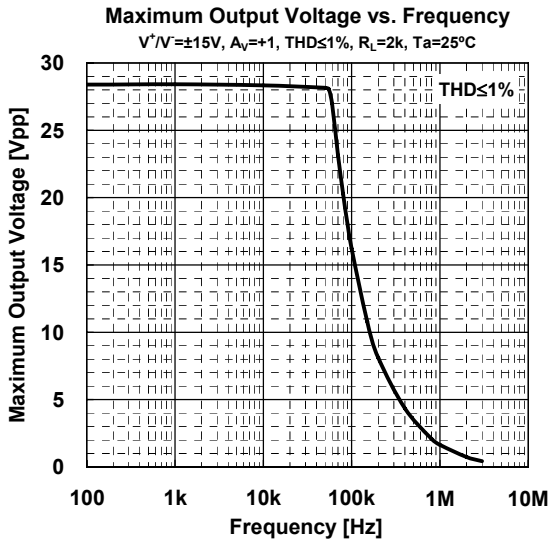
Input Offset Current vs. Temperature (Supply Voltage)
 $V_{IN}=0\text{V}, R_S=50\Omega$



■ TYPICAL CHARACTERISTICS



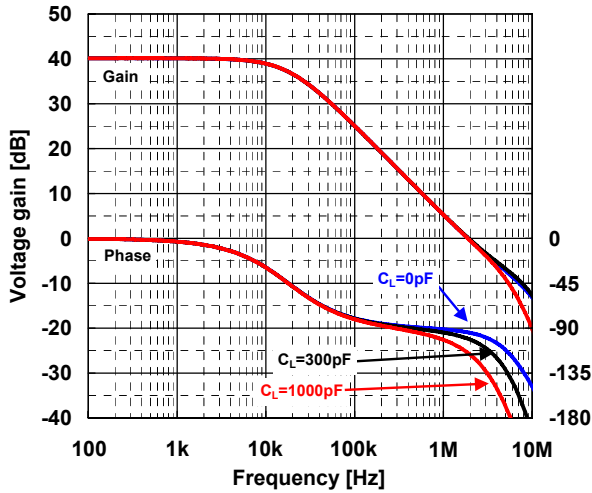
■ TYPICAL CHARACTERISTICS



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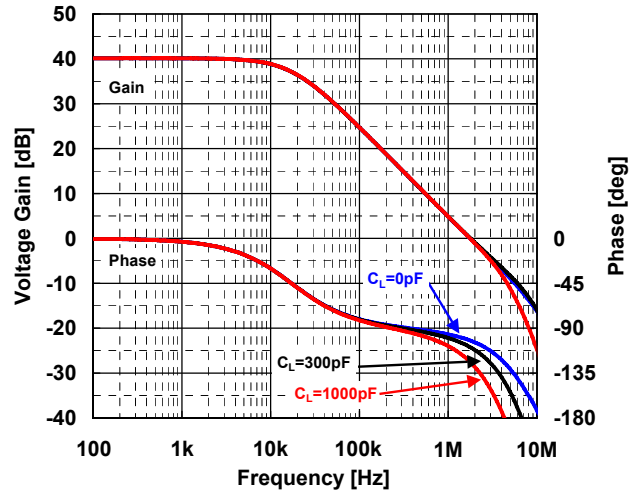
40dB Gain/Phase vs. Frequency (Load Capacitance)

$V^+/V^-=\pm 15V$, $V_{IN}=-20dBm$, $R_G=20\Omega$,
 $R_F=2k\Omega$, $R_L=2k\Omega$ to 0V, $T_a=25^\circ C$



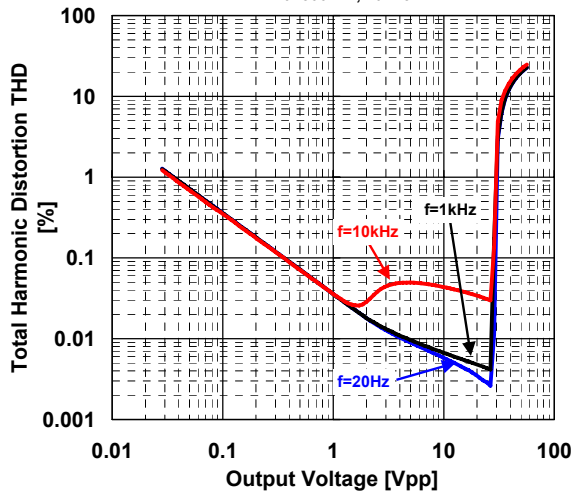
40dB gain/Phase vs. Frequency (Load Capacitance)

$V^+/V^-=\pm 2.5V$, $V_{IN}=-20dBm$, $R_G=20\Omega$,
 $R_F=2k\Omega$, $R_L=2k\Omega$ to 0V, $T_a=25^\circ C$



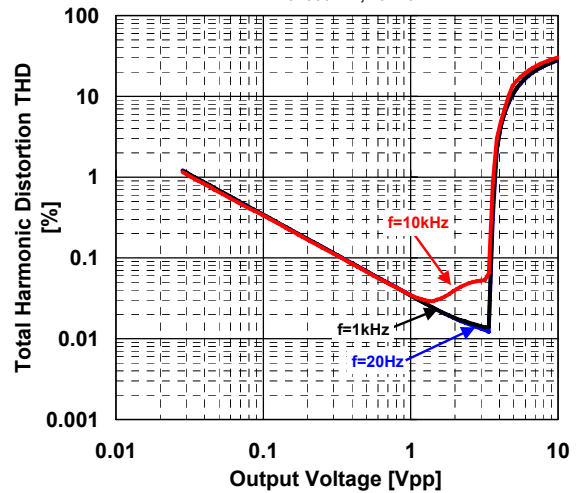
THD vs. Output Voltage (Frequency)

$V^+/V^-=\pm 15V$, $V_{IN}=2Vpp$, $A_V=20dB$, $V_O=20Vpp$,
 $R_1=1k\Omega$, $R_2=9k\Omega$, $R_G=1k\Omega$, $R_L=2k\Omega$,
 $BW=10\sim 500kHz$, $T_a=25^\circ C$



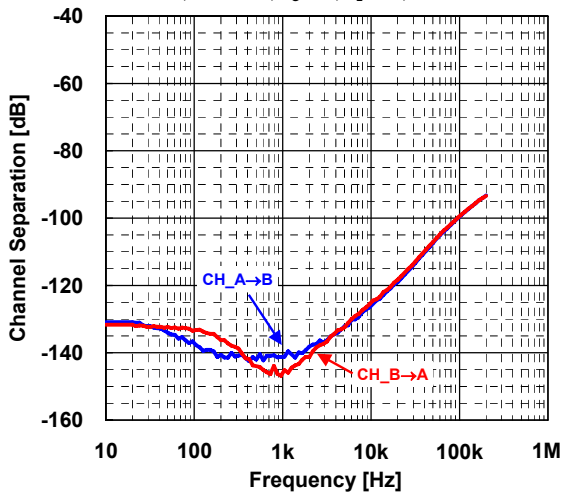
THD vs. Output Voltage (Frequency)

$V^+/V^-=\pm 2.5V$, $Z_{IN}=40\Omega$, $A_V=20dB$, $V_O=3Vpp$,
 $R_1=1k\Omega$, $R_2=9k\Omega$, $R_G=10k\Omega$, $R_L=2k\Omega$,
 $BW=10\sim 500kHz$, $T_a=25^\circ C$



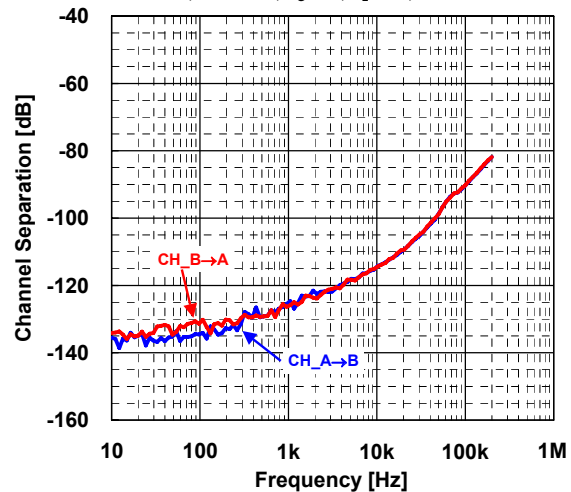
Channel Separation vs. Frequency

$V^+/V^-=\pm 15V$, $V_{IN}=200mVpp$, $Z_{IN}=20\Omega$, $A_V=40dB$, $V_O=20Vpp$,
 $R_1=1k\Omega$, $R_2=100k\Omega$, $R_G=10k\Omega$, $R_L=2k\Omega$, $BW=10\sim 500kHz$



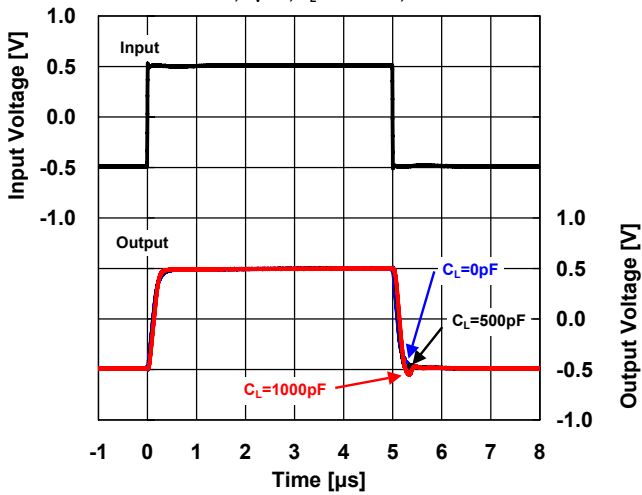
Channel Separation vs. Frequency

$V^+/V^-=\pm 2.5V$, $V_{IN}=20mVpp$, $Z_{IN}=20\Omega$, $A_V=40dB$, $V_O=2Vpp$,
 $R_1=1k\Omega$, $R_2=100k\Omega$, $R_G=10k\Omega$, $R_L=2k\Omega$, $BW=10\sim 500kHz$

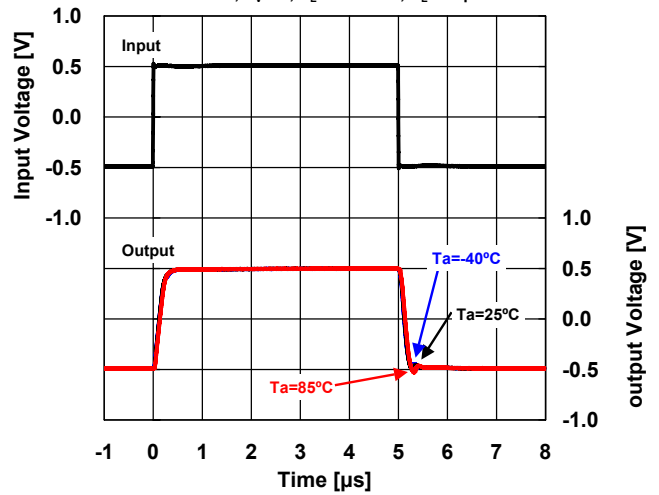


■ TYPICAL CHARACTERISTICS

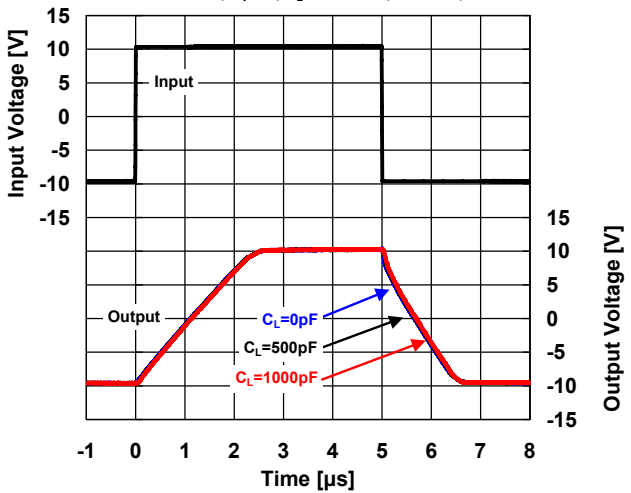
Frequency Response ($V_{IN}=1V_{pp}$, Load Capacitance)
 $V^+/V^-=\pm 15V$, $V_{IN}=1V_{pp}$,
 $f=100kHz$, $A_V=+1$, $R_L=2k\Omega$ to $0V$, $T_a=25^\circ C$



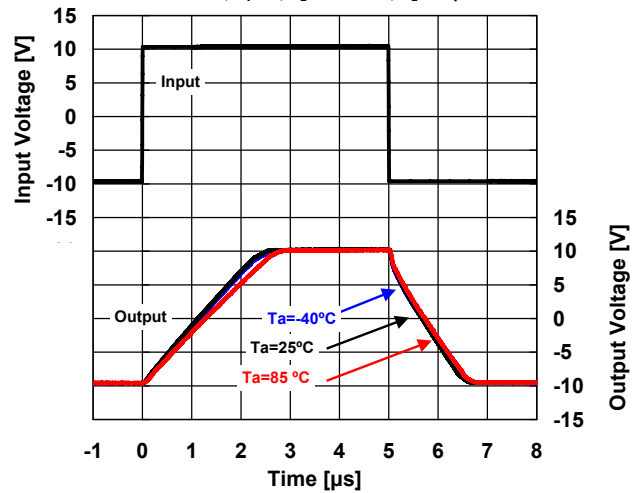
Frequency Response ($V_{IN}=1V_{pp}$, Temperature)
 $V^+/V^-=\pm 15V$, $V_{IN}=1V_{pp}$,
 $f=100kHz$, $A_V=+1$, $R_L=2k\Omega$ to $0V$, $C_L=500pF$



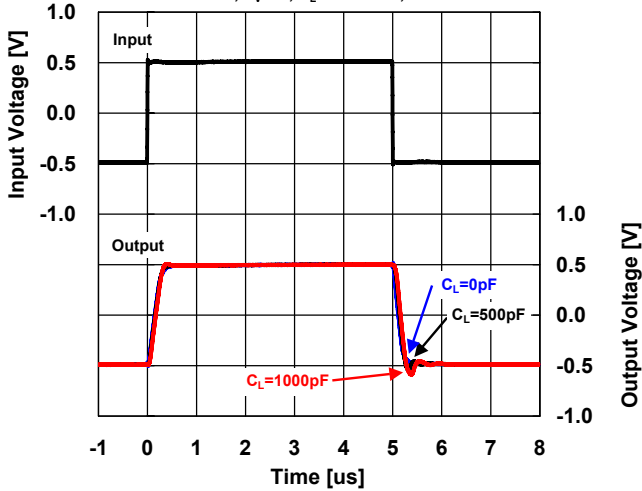
Frequency Response ($V_{IN}=20V_{pp}$, Load Capacitance)
 $V^+/V^-=\pm 15V$, $V_{IN}=20V_{pp}$,
 $f=100kHz$, $A_V=+1$, $R_L=2k\Omega$ to $0V$, $T_a=25^\circ C$



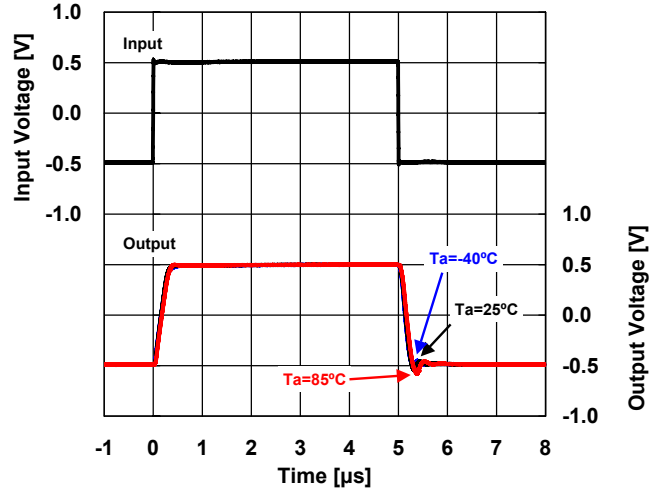
Frequency Response ($V_{IN}=20V_{pp}$, Temperature)
 $V^+/V^-=\pm 15V$, $V_{IN}=20V_{pp}$,
 $f=100kHz$, $A_V=+1$, $R_L=2k\Omega$ to $0V$, $C_L=500pF$



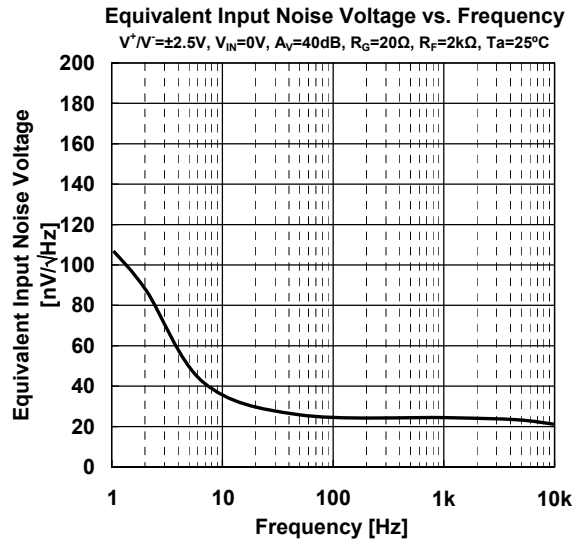
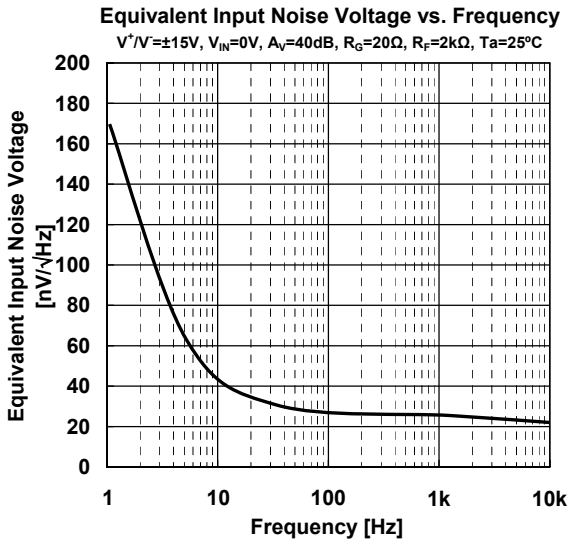
Frequency Response ($V_{IN}=1V_{pp}$, Load Capacitance)
 $V^+/V^-=\pm 2.5V$, $V_{IN}=1V_{pp}$,
 $f=100kHz$, $A_V=+1$, $R_L=2k\Omega$ to $0V$, $T_a=25^\circ C$



Frequency Response ($V_{IN}=1V_{pp}$, Temperature)
 $V^+/V^-=\pm 2.5V$, $V_{IN}=1V_{pp}$,
 $f=100kHz$, $A_V=+1$, $R_L=2k\Omega$ to $0V$, $C_L=500pF$



■ TYPICAL CHARACTERISTICS



■ TEST CIRCUIT

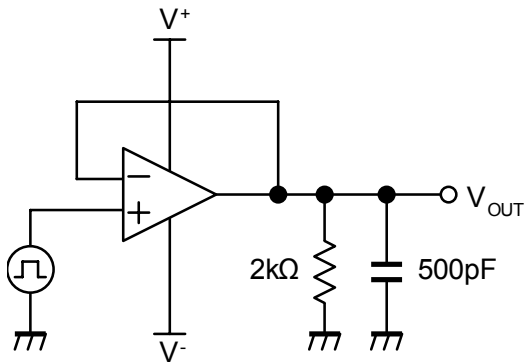


Fig.2.1 Slew Rate (Non Inverting)

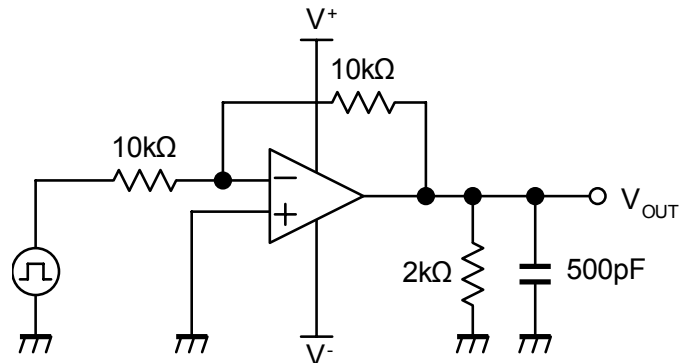


Fig.2.2 Slew Rate (Inverting)

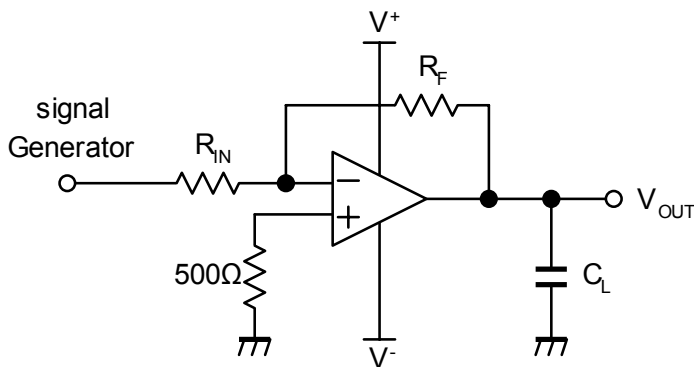


Fig.2.3 Settling Time

[CAUTION]

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