Single Supply, Rail-to-Rail Output Dual Operational Amplifier

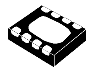
■GENERAL DESCRIPTION

The NJM2746 is a Rail-to-Rail Output single supply dual operational amplifier with a low noise of 10nV/√Hz.

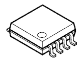
It has an output voltage swing closer to the rails, which can offer a wide dynamic range of output voltage easer compared with conventionally single supply operational amplifiers.

And Input voltage range extended from ground level makes it suited for single supply operation. The NJM2746 is suitable for various amplifiers and filters using in sound processing, signal detection and other applications. The NJM2746 is available in a wide variety of packages, SOP8 (DMP8), SOP8 JEDEC 150 mil, SSOP8, MSOP8 (TVSP8) and a small lead-less 2020 size package of ESON8 which allows high-density mounting.

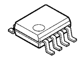
■PACKAGE INFORMATION



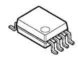
NJM2746KU1
(ESON8)



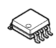
NJM2746M
(DMP8)



NJM2746E
(SOP8)



NJM2746V
(SSOP8)



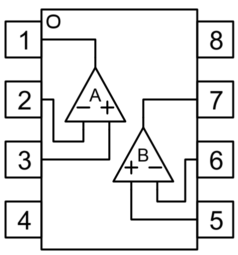
NJM2746RB1
(MSOP8 (TVSP8))

■ FEATURES

●Operating Voltage	2.5V to 14V
●Rail-to-Rail Output	V_{OH} ≥4.9V Typ. (at V^+=5V, R_L=5kΩ)
	V_{OL} ≤0.1V Typ. (at V^+=5V, R_L=5kΩ)
●Offset Voltage	1mV Typ.
●Slew Rate	3.5V/µs Typ.
●Low Distortion	0.001% Typ. (at V^+=5V, f=1kHz)
●Low Input Voltage Noise	10nV/√Hz Typ. (at f=1kHz)
●Bipolar Technology	
●Package Outline	DMP8,
	SSOP8,
	MSOP8 (TVSP8) MEET JEDEC MO-187-DA / THIN TYPE
	SOP8 JEDEC 150mil,
	ESON8 (2020)

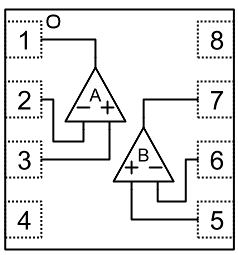
■ PIN CONFIGURATION

(Top View)

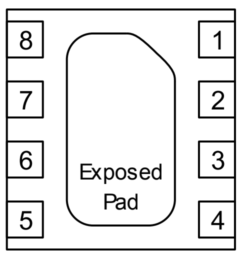


NJM2746M
NJM2746E
NJM2746V
NJM2746RB1

(Top View)



(Bottom View)



NJM2746KU1

About Exposed Pad
Connect the Exposed Pad on the GND.

PIN FUNCTION

1. **A OUTPUT**
2. **A - INPUT**
3. **A +INPUT**
4. **GND(V^-)**
5. **B +INPUT**
6. **B - INPUT**
7. **B OUTPUT**
8. **V^+**

■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V^+	15	V
Common Mode Input Voltage Range	V_{ICM}	0~15(Note1)	V
Differential Input Voltage Range	V_{ID}	±15(Note1)	V
Power Dissipation	P_D	(DMP8) 300 (SOP8) 300 (SSOP8) 250 (MSOP8(TVSP8)) 320 (ESON8) 360(Note2) (ESON8) 940(Note3)	mW
Operating Temperature Range	Topr	-40~+85	ºC
Storage Temperature Range	Tstg	-50~+125	ºC

(Note1) For supply voltage less than 15V, the absolute maximum input voltage is equal to the supply voltage.
(Note2) Mounted on the EIA/JEDEC standard board (76.2×114.3×1.6mm, 2 layer, FR-4).
(Note3) Mounted on the EIA/JEDEC standard board (76.2×114.3×1.6mm, 4 layer, FR-4).

■ OPERATING VOLTAGE (Ta=25˚C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V^+	2.5~14	V

■ ELECTRICAL CHARACTERISTICS

●DC CHARACTERISTICS (V^+=5V,Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current	Icc	R_L=∞, V_{IN}=2.5V, No signal	-	4	5.5	mA
Input Offset Voltage	V_{IO}	R_S≤10kΩ	-	1	6	mV
Input Bias Current	I_B		-	100	350	nA
Input Offset Current	I_{IO}		-	5	100	nA
Voltage Gain	Av	R_L≥10kΩ to 2.5V, Vo=0.5V~4.5V	65	85	-	dB
Common Mode Rejection Ratio	CMR	0V≤V_{CM}≤4V	60	75	-	dB
Supply Voltage Rejection Ratio	SVR	V^+=2.5V~14V	60	80	-	dB
Maximum Output Voltage	V_{OH}	R_L≥5kΩ to 2.5V	4.75	4.9	-	V
	V_{OL}	R_L≥5kΩ to 2.5V	-	0.1	0.25	V
Common Mode Input Voltage Range	V_{ICM}	CMR≥60dB	0	-	4	V

●AC CHARACTERISTICS (V^+=5V,Ta=25˚C)

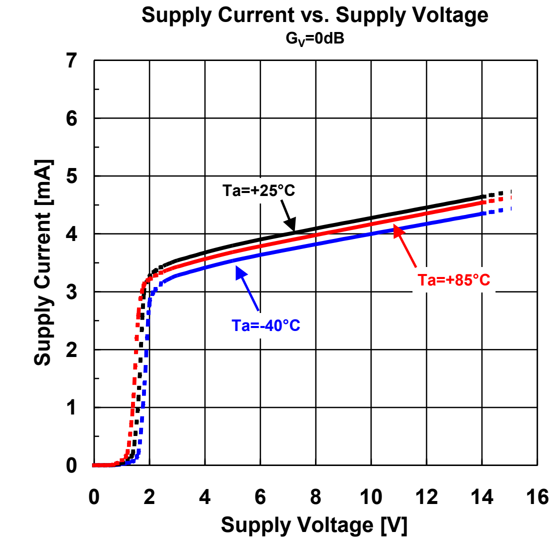
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gain Bandwidth Product	GB	f=1MHz	-	10	-	MHz
Phase Margin	Φ_M	R_L=10kΩ , C_L=10pF	-	75	-	deg
Equivalent Input Noise Voltage	V_{NI}	f=1kHz , V_{CM}=2.5V	-	10	-	nV/√Hz
Total Harmonic Distortion	THD	f=1kHz , A_V=+2, R_L=10kΩ to 2.5V , Vo=1.5Vrms	-	0.001	-	%
Channel Separation	CS	f=1kHz, R_L=10kΩ to 2.5V , Vo=1.5Vrms	-	120	-	dB

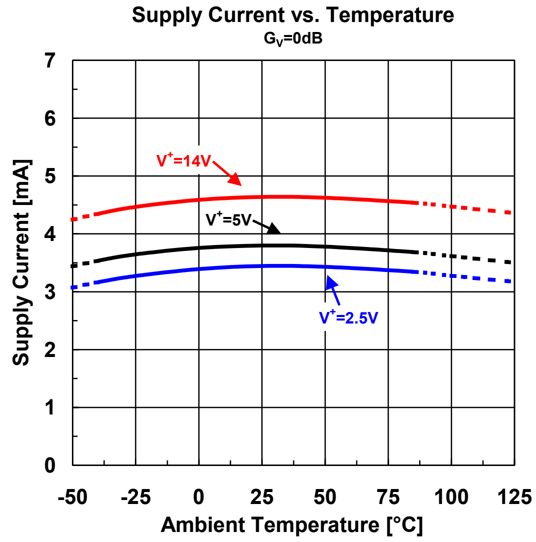
●AC CHARACTERISTICS (V^+=5V,Ta=25˚C)

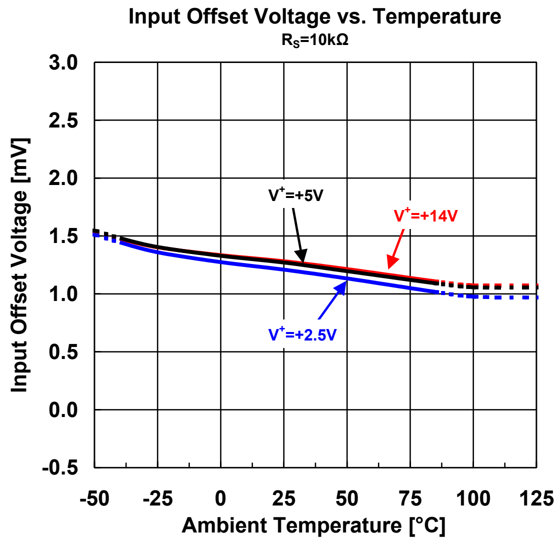
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate(Note4)	SR	A_V=1, V_{IN}=2Vpp R_L=10kΩ to 2.5V, C_L=10pF to 2.5V	-	3.5	-	V/µs

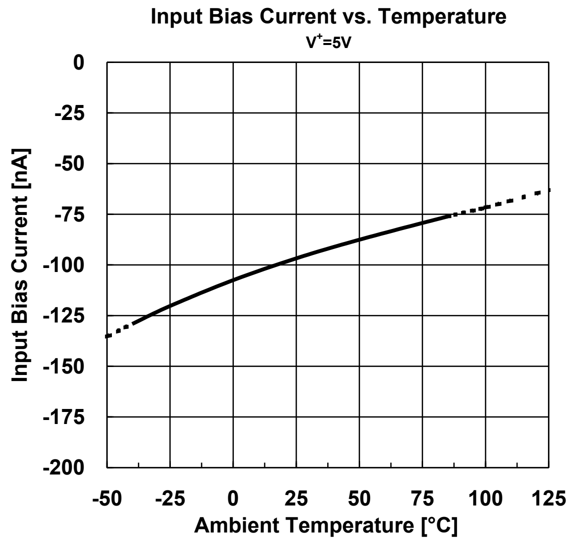
(Note4) Number specified is the slower of the positive and negative slew rates.

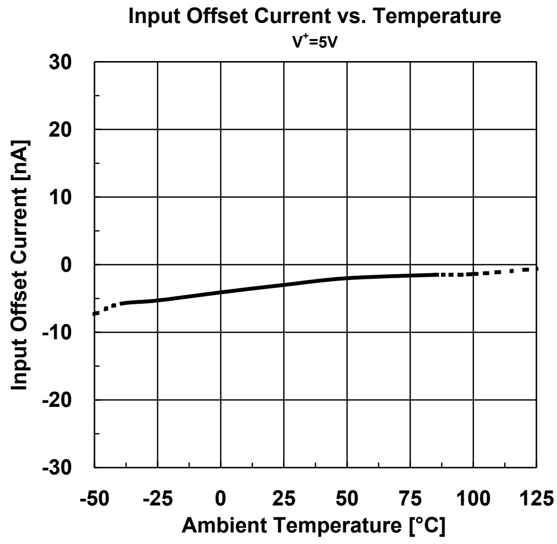
■ TYPICAL CHARACTERISTICS

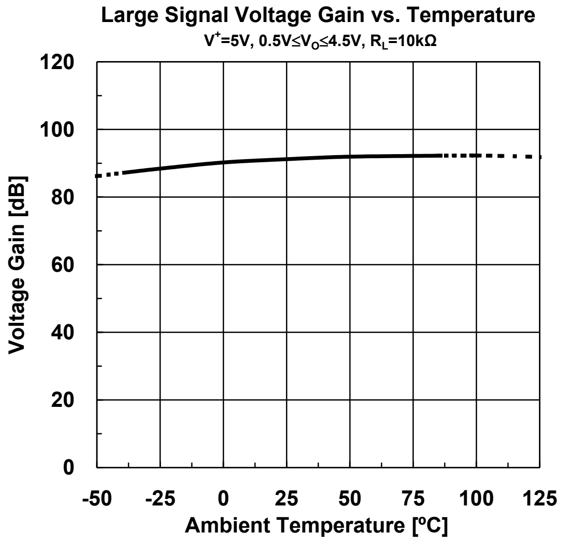






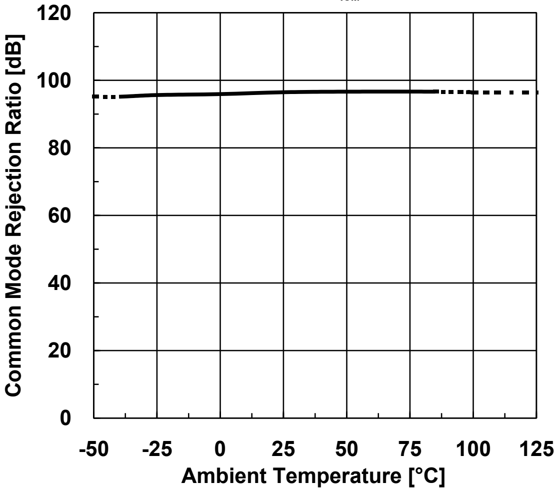




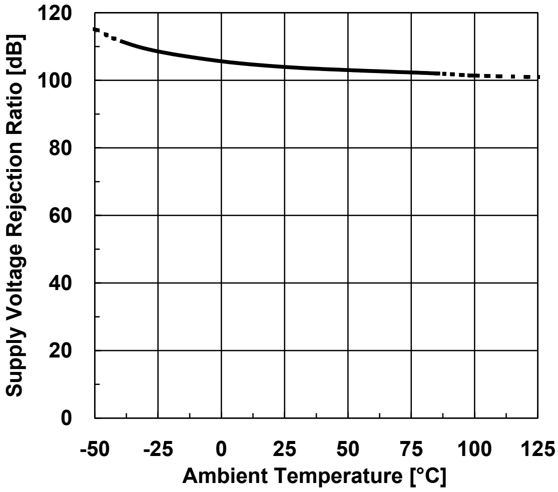


■ TYPICAL CHARACTERISTICS

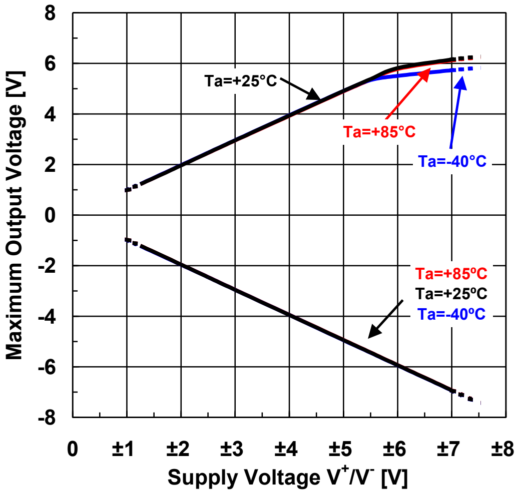
CMR vs. Temperature
V^{+}=5V, 0V≤V_{ICM}≤4V



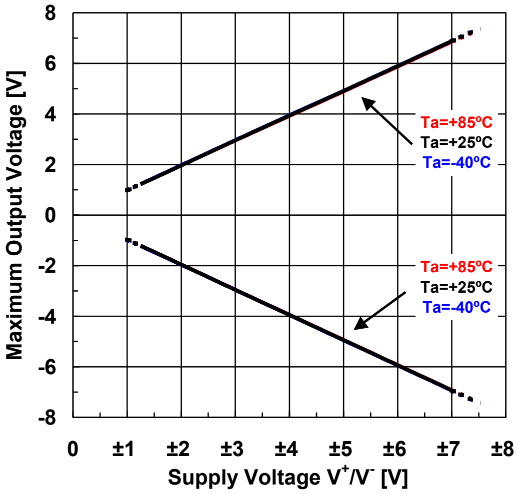
SVR vs. Temperature
V^{+}= 2.5V to 14V



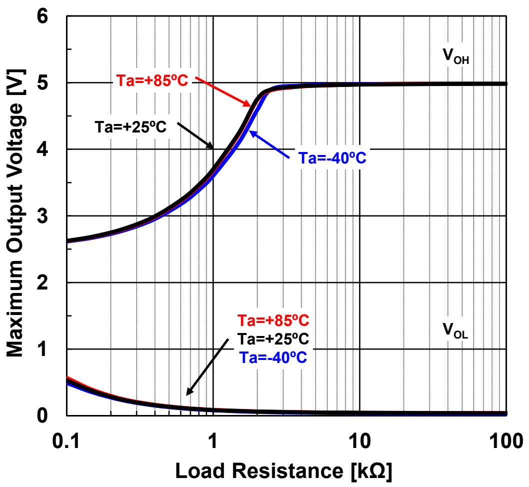
Maximum Output Voltage vs. Supply Voltage
G_V=OPEN, R_L=5kΩ to GND



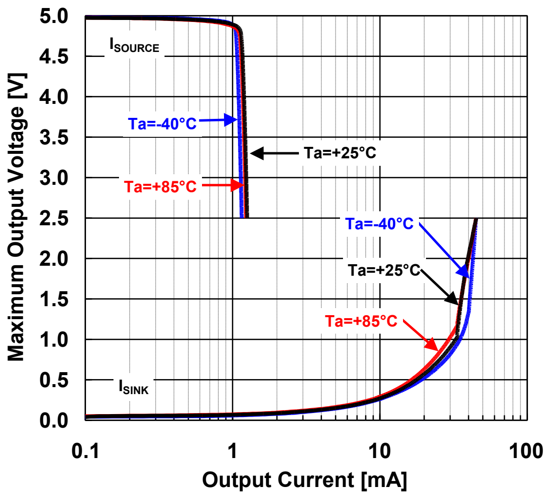
Maximum Output Voltage vs. Supply Voltage
G_V=OPEN, R_L=10kΩ to GND



Maximum Output Voltage vs. Load Resistance
V^{+}=5V, V_{COM}=2.5V, G_V=OPEN, R_L to 2.5V



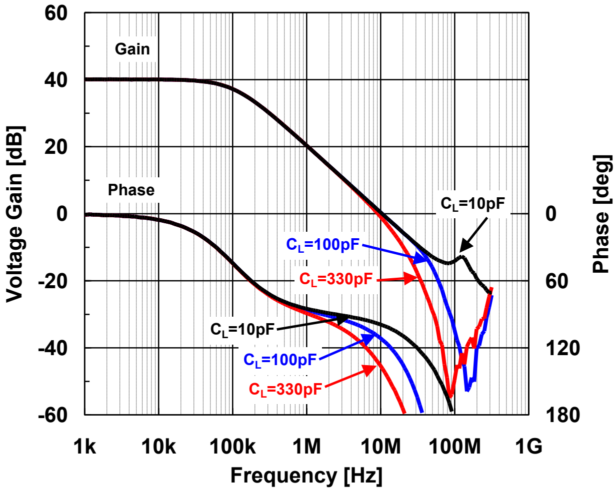
Maximum Output Voltage vs. Output Current
V^{+}=+5V, V_{CM}=+2.5V, G_V=OPEN



■ TYPICAL CHARACTERISTICS

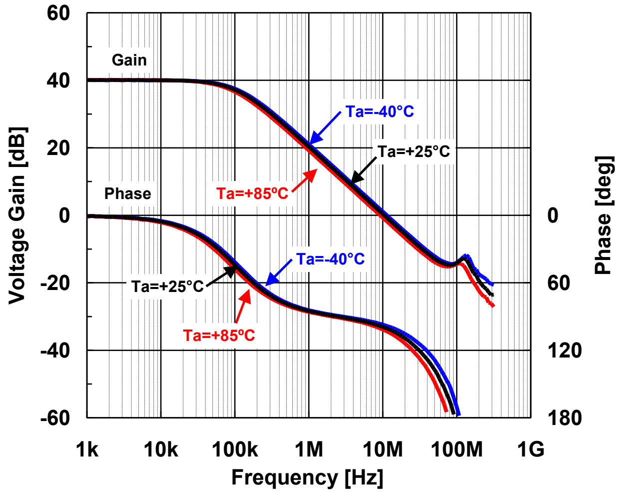
Gain/Phase vs. Frequency

V^+=5V, V_{IN}=0.02Vpp, G_V=40dB, R_T=50Ω, R_F=10kΩ, R_G=100Ω, Ta=25°C



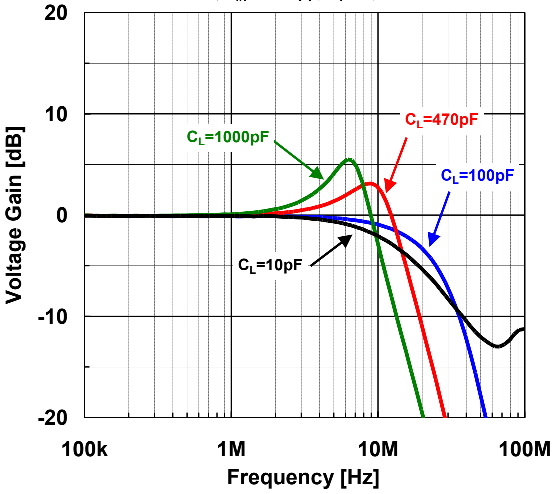
Gain/Phase vs. Frequency

V^+=5V, V_{IN}=0.02Vpp, G_V=40dB, R_T=50Ω, R_F=10kΩ, R_G=100Ω, C_L=10pF



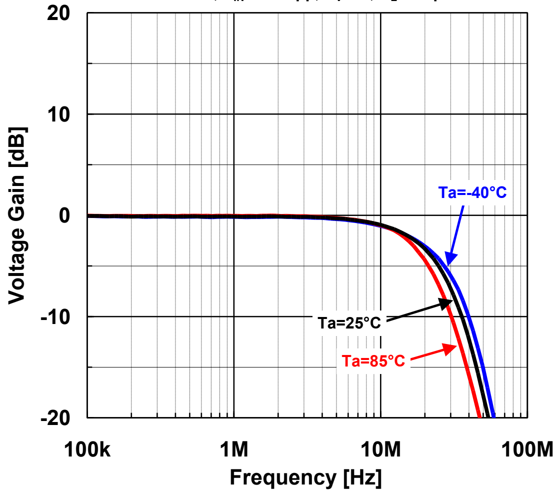
Gain vs. Frequency

V^+=5V, V_{IN}=0.02Vpp, A_V=+1, Ta=25°C



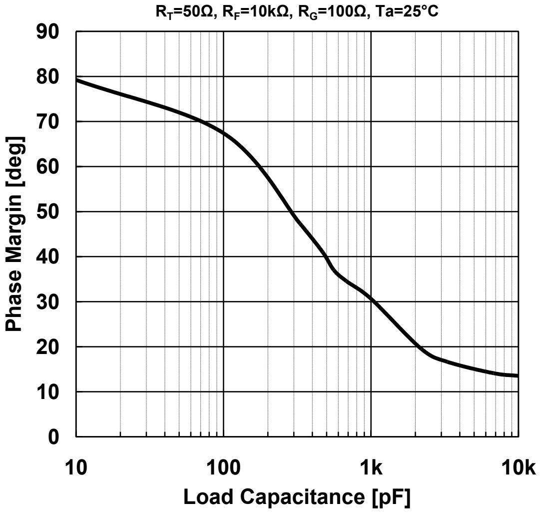
Gain vs. Frequency

V^+=5V, V_{IN}=0.02Vpp, A_V=+1, C_L=100pF



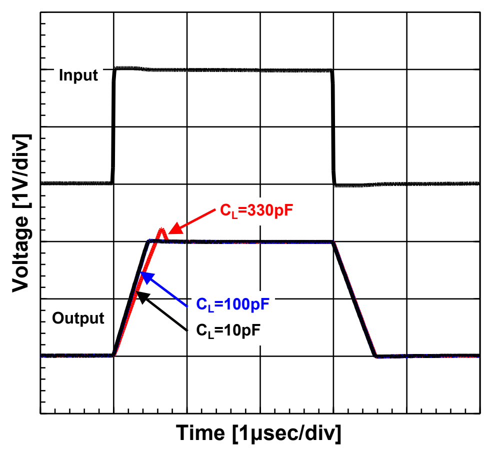
Phase Margin vs. Load Capacitance

V^+=5V, V_{IN}=0.02Vpp, V_O=V^+/2, G_V=40dB, R_T=50Ω, R_F=10kΩ, R_G=100Ω, Ta=25°C



Pulse Response

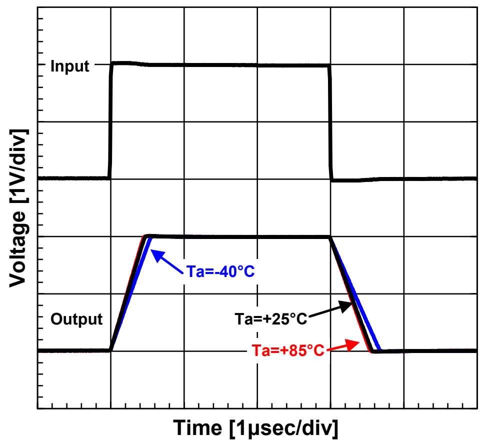
V^+=5V, V_{IN}=2Vpp, A_V=+1, R_L=10kΩ, Ta=25°C



■ TYPICAL CHARACTERISTICS

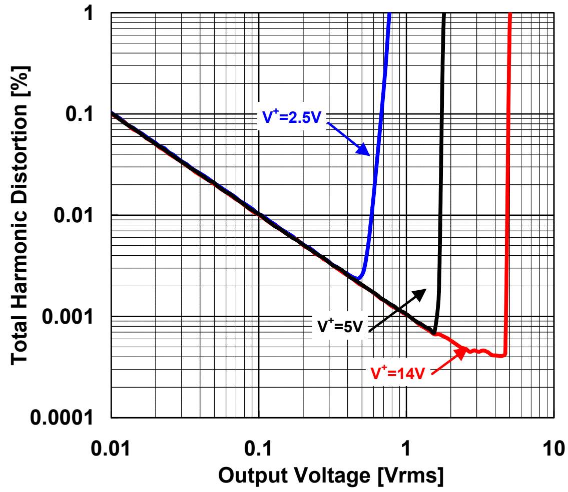
Pulse Response

V^{+}=5V, V_{IN}=2Vpp, A_V=+1, R_L=10kΩ, C_L=10pF



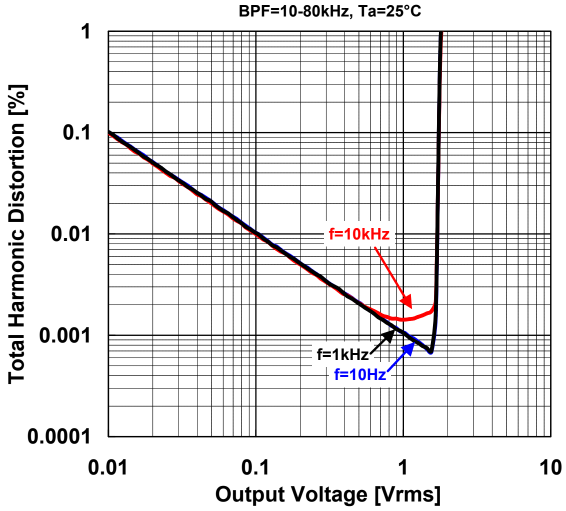
THD vs. Output Voltage

f=1kHz, A_V=+2, R_S=600Ω, R_F=5kΩ, R_G=5kΩ, BPF=10-80kHz, Ta=25°C



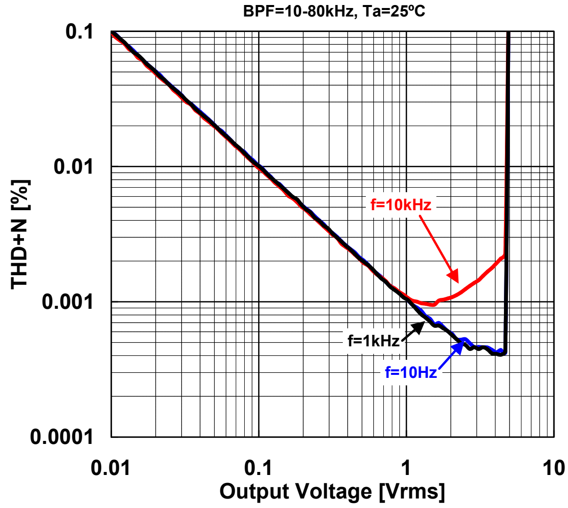
THD vs. Output Voltage

V^{+}=5V, A_V=+2, R_S=600Ω, R_F=5kΩ, R_G=5kΩ, BPF=10-80kHz, Ta=25°C



THD vs. Output Voltage

V^{+}=14V, A_V=+2, R_S=600Ω, R_F=5kΩ, R_G=5kΩ, BPF=10-80kHz, Ta=25ºC



Voltage Noise vs. Frequency

V^{+}=5V, G_V=40dB, R_F=10kΩ, R_S=100Ω, Ta=25°C