Rail-to-Rail Input/Output Dual Operational Amplifier

■ GENERAL DESCRIPTION

The NJM8532 is a Rail-to-Rail Input/Output single supply dual operational amplifier featuring low power, low noise and a low voltage operation from 1.8V.

The Rail-to-Rail Input/Output offers a wide input/output dynamic range from ground level to supply line, which provides both ground and Hi-side sensing applications.

The excellent features of low noise, low operating voltage and high phase margin make the NJM8532 well-suited for various applications such as battery powered devices, portable audio devices, sensor applications and others.

■ PACKAGE OUTLINE

NJM8532RB1
(MSOP8 (TVSP8))

NJM8532M
(DMP8)

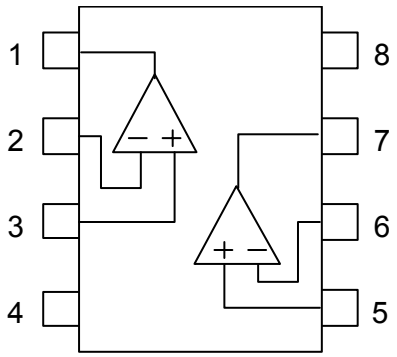
NJM8532V
(SSOP8)

■ FEATURES

●Operating Voltage	1.8 to 14.0V
●Rail-to-Rail Input	V_{ICM}= 0 to 5.0V, (at V^+=5V)
●Rail-to-Rail Output	V_{OH}≥4.9V/ V_{OL}≤0.1V, (at V^+=5V, R_L=20kΩ)
●Load Drivability	V_{OH}≥4.75V/ V_{OL}≤0.25V, (at V^+=5V, R_L=2kΩ)
●Offset Voltage	5mV max.
●Slew Rate	0.4V/μs typ.
●Low Input Voltage Noise	10nV/√Hz typ. (at f=1kHz)
●Adequate phase margin	Φ_M=75deg. typ., (at R_L=2kΩ, voltage follower)
●Bipolar Technology	
●Package Outline	SSOP8
	DMP8
	MSOP8 (TVSP8)MEET JEDEC MO-187-DA / THIN TYPE

■ PIN CONFIGURATION

(Top View)



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

(Ta=25˚C)

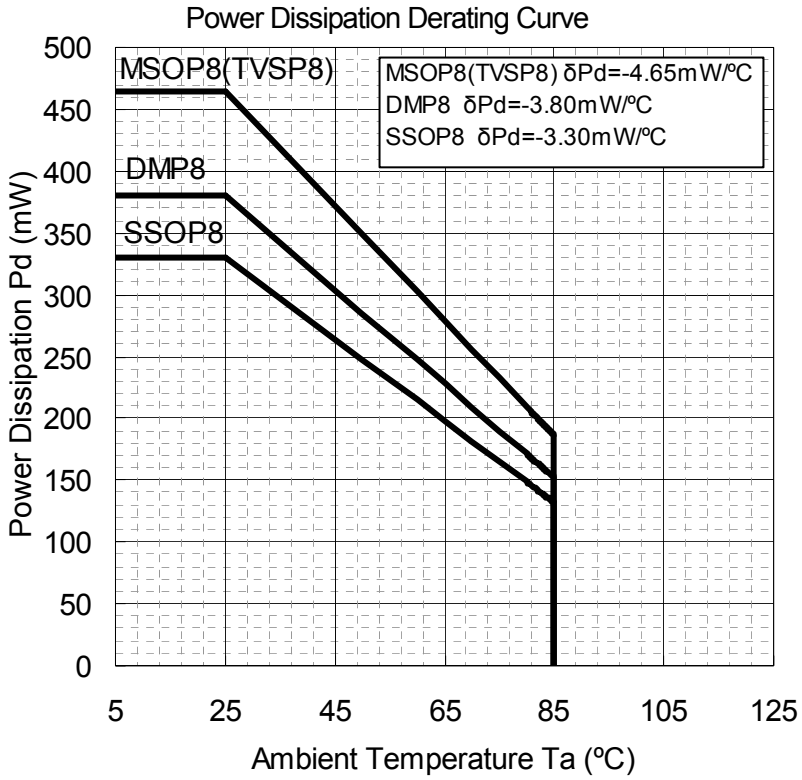
PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+	15.0	V
Differential Input Voltage Range	V_{ID}	±1.0	V
Common Mode Input Voltage Range	V_{IC}	0 ~15.0 (Note1)	V
Power Dissipation (Note3)	P_D	(MSOP8(TVSP8)) 465 (Note2) (DMP8) 380 (Note2) (SSOP8) 330 (Note2)	mW
Operating Temperature Range	T_{opr}	-40~+85	˚C
Storage Temperature Range	T_{stg}	-40~+125	˚C

(Note1) For supply voltage less than 15V, the absolute maximum input voltage is equal to the supply voltage.

(Note2) On the PCB "EIA/JEDEC (76.2×114.3×1.6mm, 2 layers, FR-4)"

(Note3) See “Figure1"Power Dissipation Derating Curve" when ambient temperature is over 25ºC.

Figure1



■ RECOMMENDED OPERATING CONDITION

(Ta=25˚C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V^+	1.8 to 14.0	V

■ **ELECTRICAL CHARACTERISTICS** (V^+=5V, Ta=25˚C)

●DC CHARACTERISTICS (V^+=5V, Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current	I_{CC}	No signal applied	-	580	900	μA
Input Offset Voltage	V_{IO}		-	1	5	mV
Input Bias Current	I_B		-	50	250	nA
Input Offset Current	I_{IO}		-	5	100	nA
Large Signal Voltage Gain	A_V	R_L=2kΩ	60	85	-	dB
Common Mode Rejection Ratio	CMR	CMR+: 2.5V≤V_{CM}≤5V CMR-: 0V≤V_{CM}≤2.5V (Note4)	55	70		dB
Supply Voltage Rejection Ratio	SVR	V^+/V^-=±2.0V ~ ±3.0V	70	85	-	dB
Maximum Output Voltage 1	V_{OH1}	R_L=20kΩ	4.9	4.95	-	V
	V_{OL1}	R_L=20kΩ	-	0.05	0.1	V
Maximum Output Voltage 2	V_{OH2}	R_L=2kΩ	4.75	4.85	-	V
	V_{OL2}	R_L=2kΩ	-	0.15	0.25	V
Input Common Mode Voltage Range	V_{ICM}	CMR≥55dB	0	-	5	V

(Note4) CMR is represented by either CMR+ or CMR- has lower value.

CMR+ is measured with 2.5V≤V_{CM}≤5.0 and CMR- is measured with 0V≤V_{CM}≤2.5V.

●AC CHARACTERISTICS (V^+=5V, Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Unity Gain Bandwidth	GB	R_L=2kΩ	-	1	-	MHz
Phase Margin	Φ_M	R_L=2kΩ	-	75	-	Deg
Equivalent Input Noise Voltage	V_{NI}	f=1kHz	-	10	-	nV/√Hz

●TRANSIENT CHARACTERISTICS (V^+=5V, Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	R_L=2kΩ	-	0.4	-	V/μs

■ **ELECTRICAL CHARACTERISTICS** (V^+=3V, Ta=25˚C)

●DC CHARACTERISTICS (V^+=3V, Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current	I_{CC}	No signal applied	-	510	880	μA
Input Offset Voltage	V_{IO}		-	1	5	mV
Input Bias Current	I_B		-	50	250	nA
Input Offset Current	I_{IO}		-	5	100	nA
Large Signal Voltage Gain	A_V	R_L=2kΩ	60	84	-	dB
Common Mode Rejection Ratio	CMR	CMR+: 1.5V≤V_{CM}≤3V CMR-: 0V≤V_{CM}≤1.5V (Note5)	48	63		dB
Supply Voltage Rejection Ratio	SVR	V^+/V^-=±1.2V ~ ±2.0V	68	83	-	dB
Maximum Output Voltage 1	V_{OH1}	R_L=20kΩ	2.9	2.95	-	V
	V_{OL1}	R_L=20kΩ	-	0.05	0.1	V
Maximum Output Voltage 2	V_{OH2}	R_L=2kΩ	2.75	2.85	-	V
	V_{OL2}	R_L=2kΩ	-	0.15	0.25	V
Input Common Mode Voltage Range	V_{ICM}	CMR≥48dB	0	-	3	V

(Note5) CMR is represented by either CMR+ or CMR-has lower value.

CMR+ is measured with 1.5V≤V_{CM}≤3.0 and CMR- is measured with 0V≤V_{CM}≤1.5V.

●AC CHARACTERISTICS (V^+=3V, Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Unity Gain Bandwidth	GB	R_L=2kΩ	-	1	-	MHz
Phase Margin	Φ_M	R_L=2kΩ	-	75	-	Deg
Equivalent Input Noise Voltage	V_{NI}	f=1kHz	-	10	-	nV/√Hz

●TRANSIENT CHARACTERISTICS (V^+=3V, Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	R_L=2kΩ	-	0.35	-	V/μs

■ **ELECTRICAL CHARACTERISTICS** (V^+=1.8V, Ta=25˚C)

●DC CHARACTERISTICS (V^+=1.8V, Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current	I_{CC}	No signal applied	-	460	800	μA
Input Offset Voltage	V_{IO}		-	1	5	mV
Input Bias Current	I_B		-	50	250	nA
Input Offset Current	I_{IO}		-	5	100	nA
Large Signal Voltage Gain	A_V	R_L=2kΩ	60	83	-	dB
Common Mode Rejection Ratio	CMR	CMR+: 0. 9V≤V_{CM}≤1.8V CMR-: 0V≤V_{CM}≤0.9V (Note6)	40	55		dB
Supply Voltage Rejection Ratio	SVR	V^+/V^-=±1.2V ~ ±2.0V	65	80	-	dB
Maximum Output Voltage 1	V_{OH1}	R_L=20kΩ	1.7	1.75	-	V
	V_{OL1}	R_L=20kΩ	-	0.05	0.1	V
Maximum Output Voltage 2	V_{OH2}	R_L=2kΩ	1.55	1.65	-	V
	V_{OL2}	R_L=2kΩ	-	0.15	0.25	V
Input Common Mode Voltage Range	V_{ICM}	CMR≥40dB	0	-	1.8	V

(Note6) CMR is represented by either CMR+ or CMR-has lower value.

CMR+ is measured with 0.9V≤V_{CM}≤1.8 and CMR- is measured with 0V≤V_{CM}≤0.9V.

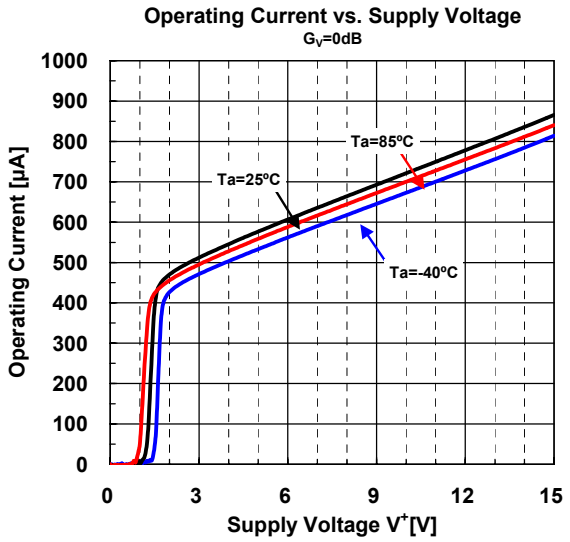
●AC CHARACTERISTICS (V^+=1.8V, Ta=25˚C)

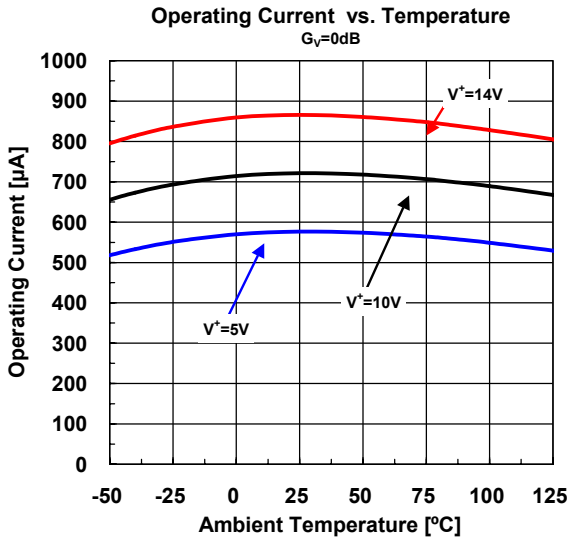
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Unity Gain Bandwidth	GB	R_L=2kΩ	-	1	-	MHz
Phase Margin	Φ_M	R_L=2kΩ	-	75	-	Deg
Equivalent Input Noise Voltage	V_{NI}	f=1kHz	-	10	-	nV/√Hz

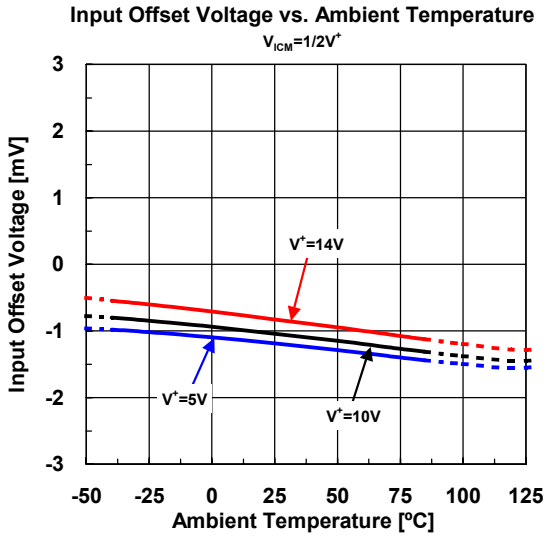
●TRANSIENT CHARACTERISTICS (V^+=1.8V, Ta=25˚C)

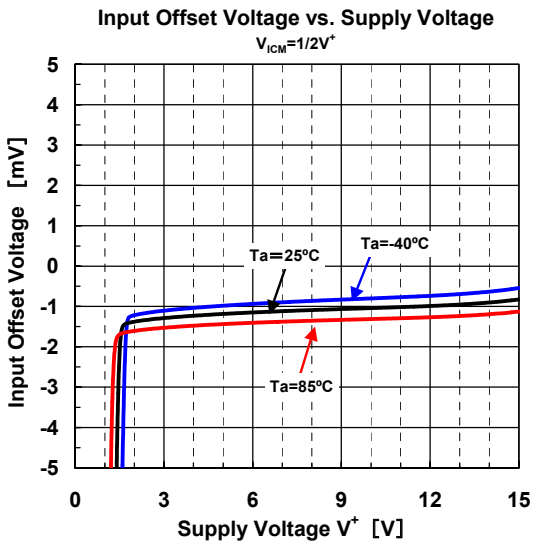
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	R_L=2kΩ	-	0.3	-	V/μs

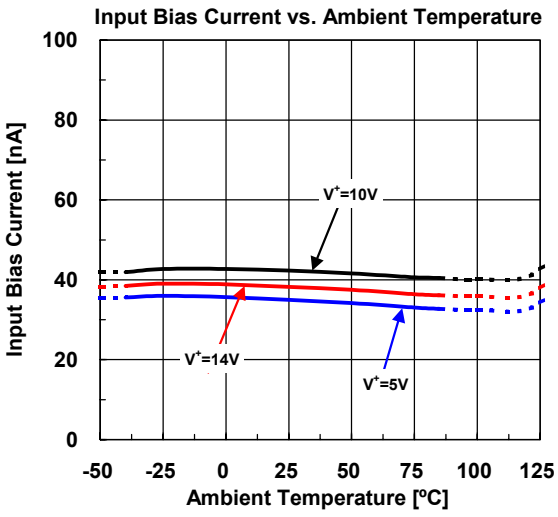
■ TYPICAL CHARACTERISTICS

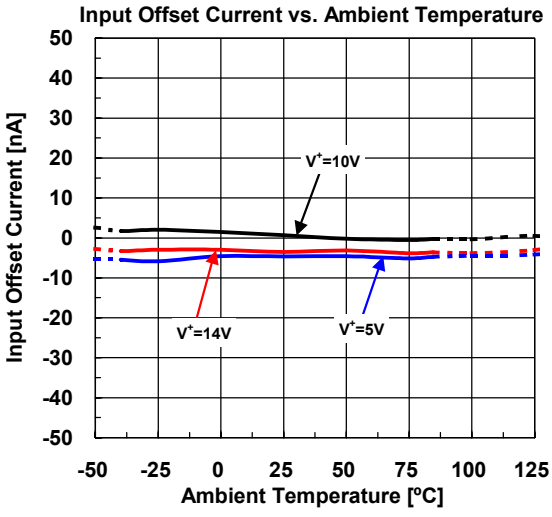






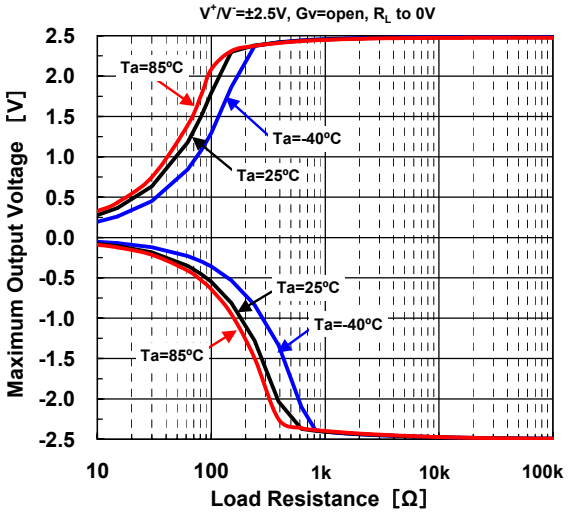




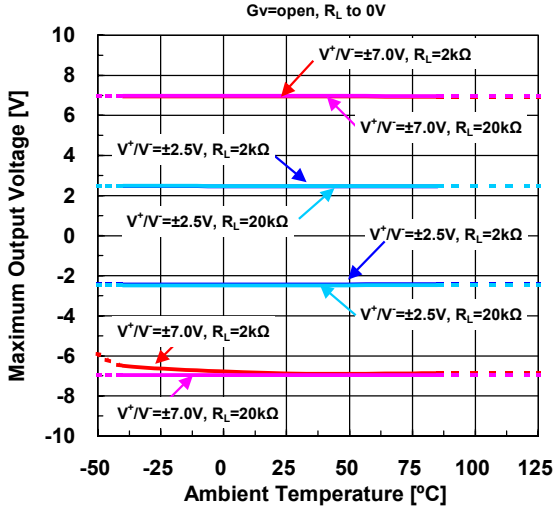


■ TYPICAL CHARACTERISTICS

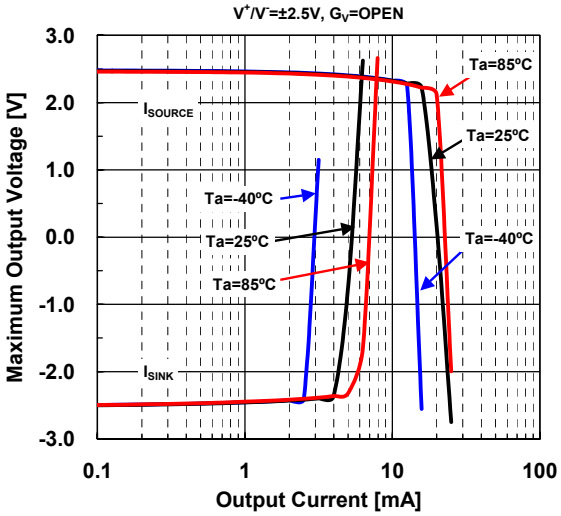
Maximum Output Voltage vs. Load Resistance



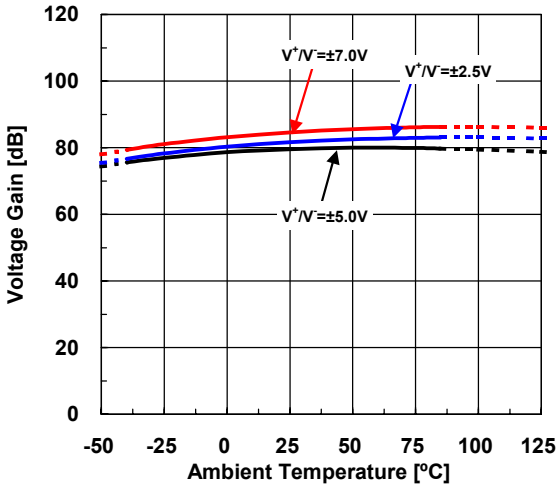
Maximum Output Voltage vs. Ambient Temperature



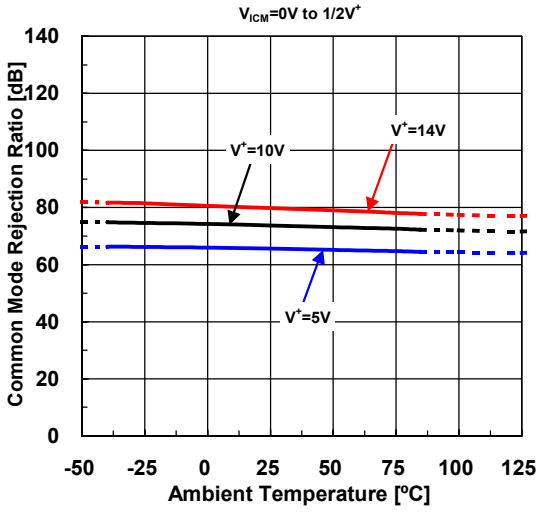
Maximum Output Voltage vs. Output Current



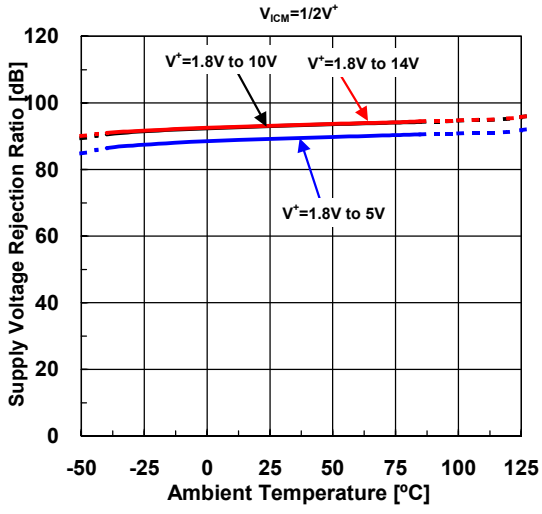
Voltage Gain vs. Ambient Temperature



Common Mode Rejection Ratio vs. Ambient Temperature



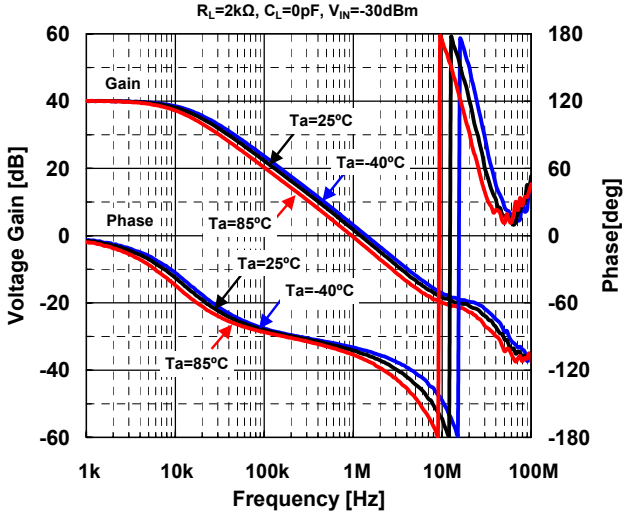
Supply Voltage Rejection Ratio vs. Ambient Temperature



■ TYPICAL CHARACTERISTICS

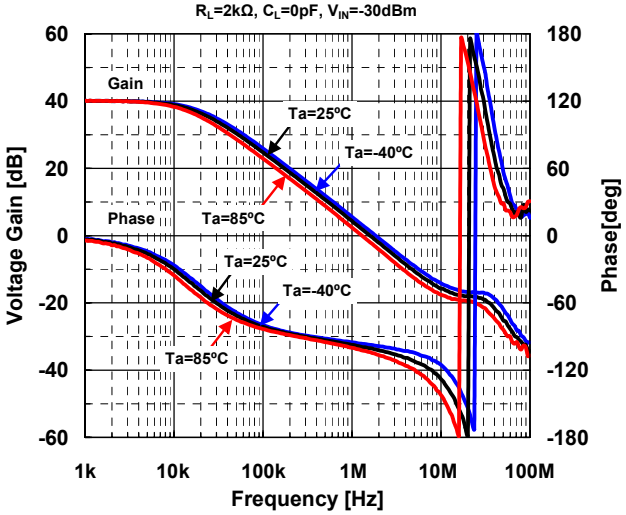
Voltage Gain/Phase vs. Frequency

V^+/V^-=±2.5V, G_V=40dB, R_F=10kΩ, R_T=50Ω,
R_L=2kΩ, C_L=0pF, V_{IN}=-30dBm



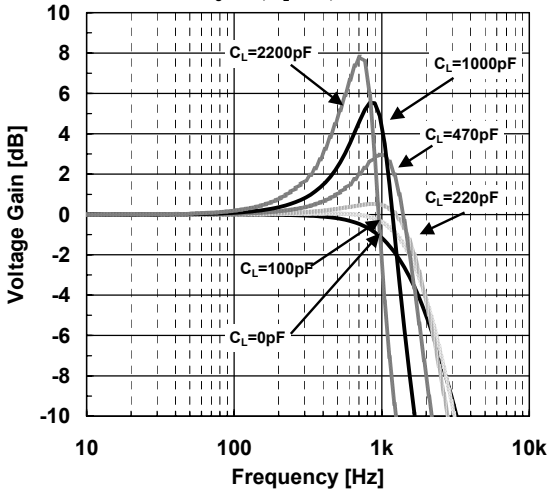
Voltage Gain/Phase vs. Frequency

V^+/V^-=±7.0V, A_V=40dB, R_F=10kΩ, R_T=50Ω,
R_L=2kΩ, C_L=0pF, V_{IN}=-30dBm



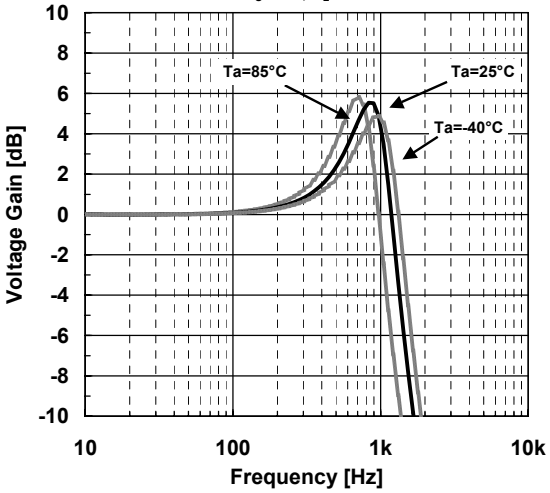
Voltage Gain vs. Frequency

V^+/V^-=±2.5V, G_V=0dB
R_S=50Ω, R_L=2kΩ, Ta=+25°C



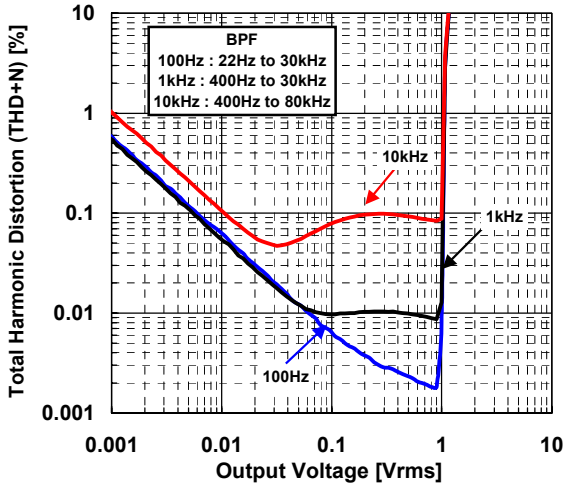
Voltage Gain vs. Frequency

V^+/V^-=±2.5V, G_V=0dB, C_L=1000pF
R_S=50Ω, R_L=2kΩ



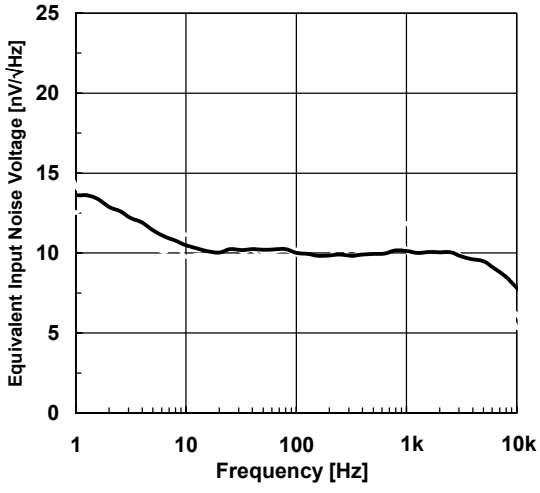
Total Harmonic Distortion vs. Output Voltage

V^+/V^-=±1.5V, G_V=6dB, R_L=2kΩ to 0V, C_L=0pF, Ta=25°C



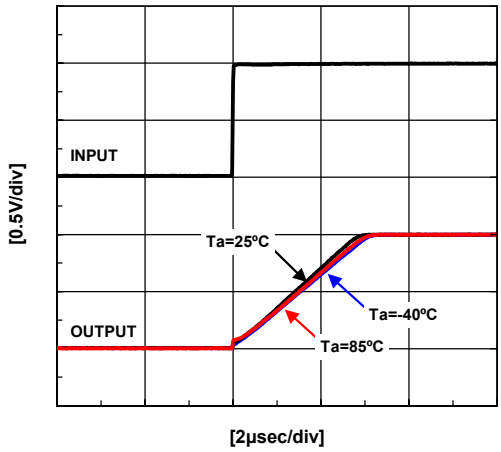
Equivalent Input Noise Voltage vs. Frequency

V^+/V^-=±2.5V, G_V=40dB, R_L=2kΩ, C_L=0pF, Ta=25°C

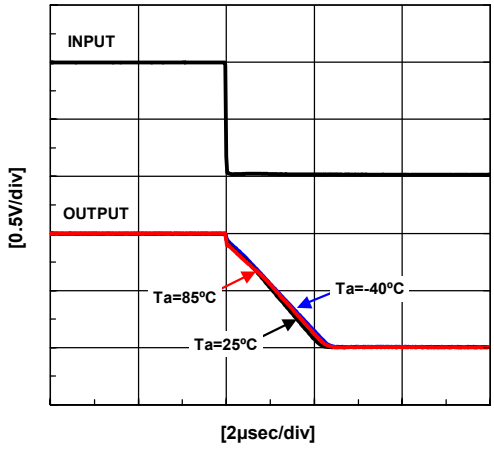


■ TYPICAL CHARACTERISTICS

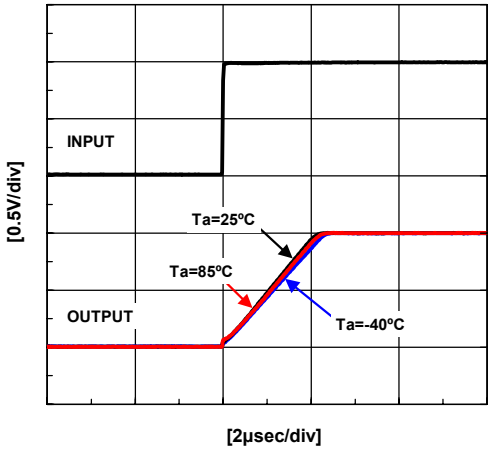
Pulse Response (Rise)
V^+/V^-=±2.5V, V_{IN}=1V_{P-P}, f=10kHz
Gv=0dB, R_L=10kΩ to GND, C_L=0pF



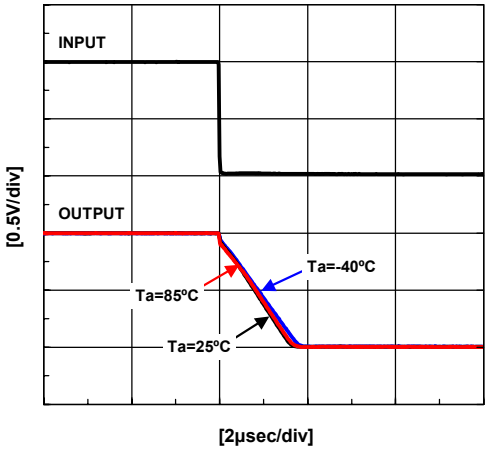
Pulse Response (Fall)
V^+/V^-=±2.5V, V_{IN}=1V_{P-P}, f=10kHz
Gv=0dB, R_L=10kΩ to GND, C_L=0pF



Pulse Response (Rise)
V^+/V^-=±7.0V, V_{IN}=1V_{P-P}, f=10kHz
Gv=0dB, R_L=10kΩ to GND, C_L=0pF



Pulse Response (Fall)
V^+/V^-=±7.0V, V_{IN}=1V_{P-P}, f=10kHz
Gv=0dB, R_L=10kΩ to GND, C_L=0pF



[CAUTION]
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