

Full-Swing Input and Output type Dual Operational Amplifier

■ GENERAL DESCRIPTION

NJM2732 is dual operational amplifier with full swing input and output, operate from 1.8V.

Input and Output Full Swing provides wide dynamic range, is from ground to power supply level. In addition to ground sensing applications, NJM2732 enable to be applied to Hi-side sensing applications.

The features are low noise and low operating voltage for battery management, portable audio applications, and others.

■ PACKAGE OUTLINE



NJM2732D



NJM2732M



NJM2732E



NJM2732V



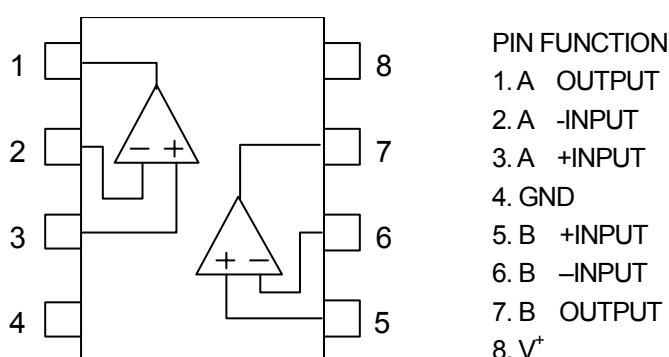
NJM2732RB1

■ FEATURES

- Operating Voltage : 1.8 to 6.0V
- Input Full-Swing : $V_{ICM} = 0$ to 5.0V, at $V^+ = 5V$
- Output Full-Swing : $V_{OH} \geq 4.9V / V_{OL} \leq 0.1V$, at $V^+ = 5V, R_L = 20k\Omega$
- Load Drivability : $V_{OH} \geq 4.75V / V_{OL} \leq 0.25V$, at $V^+ = 5V, R_L = 2k\Omega$
- Offset Voltage : 5mV max.
- Slew Rate : 0.4V/ μ s typ.
- Low Input Voltage Noise : 10nV/ \sqrt{Hz} typ.
- Adequate phase margin : $\Phi_M = 75deg$. typ., at $R_L = 2k\Omega$, voltage follower
- Bipolar Technology
- Package Outline : DIP8, DMP8, EMP8, SSOP8, TVSP8

■ PIN CONFIGURATION

(Top View)



NJM2732D

NJM2732M

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■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V ⁺	7.0	V
Differential Input Voltage Range	V _{ID}	±1.0	V
Common Mode Input Voltage Range	V _{IC}	0 ~ 7.0 (Note1)	V
Power Dissipation	P _D	(DIP8) 500 (DMP8) 300 (EMP8) 320 (SSOP8) 250 (TVSP8) 320	mW
Operating Temperature Range	T _{opr}	-40~+85	°C
Storage Temperature Range	T _{stg}	-40~+125	°C

(Note1) For supply voltage less than 7V, the absolute maximum input voltage is equal to the supply voltage.

■ RECOMMENDED OPERATING CONDITION

(Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V ⁺	1.8 to 6.0	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 (Note2)	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
Maximum Output Voltage 2	V _{OL1}	R _L =20kΩ	-	0.05	0.1	V
Input Common Mode Voltage Range	V _{ICM}	V _{OH2} R _L =2kΩ	4.75	4.85	-	V
		V _{OL2} R _L =2kΩ	-	0.15	0.25	V
		CMR≥55dB	0	-	5	V

(Note2) 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 ($V^+ = 3V$, $T_a = 25^\circ C$)

● 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 (Note3)	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

(Note3) 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 ($V^+ = 1.8V$, $T_a = 25^\circ C$)

● 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 (Note4)	48	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

(Note4) 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)

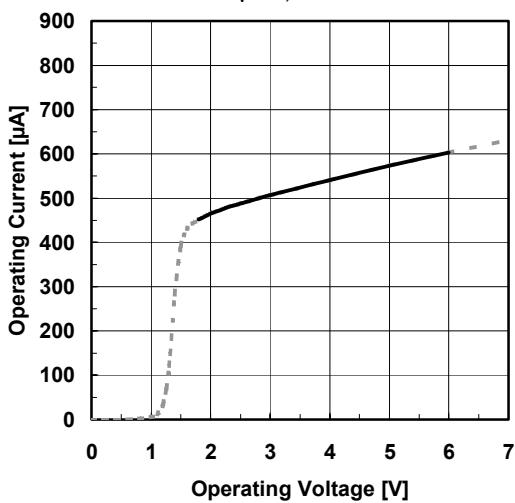
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	R _L =2kΩ	-	0.3	-	V/µs

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■ TYPICAL CHARACTERISTICS

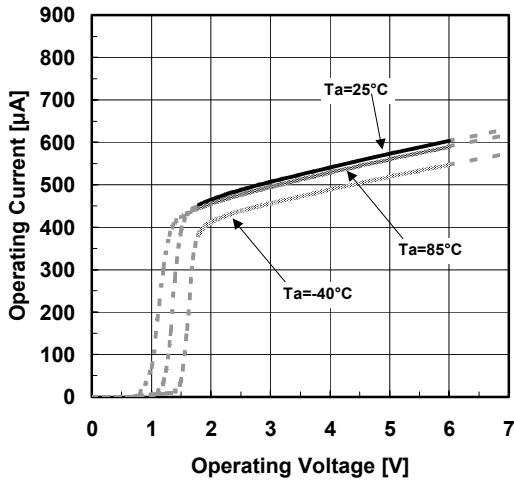
Operating Current vs Operating Voltage

$G_V=0\text{dB}$, $T_a=25^\circ\text{C}$



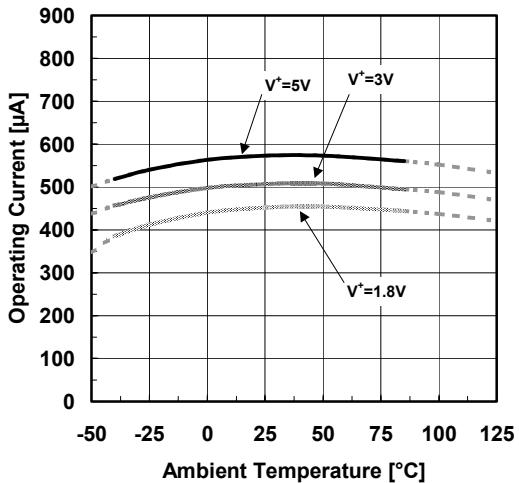
Operating Current vs. Operating Voltage
(correlation with T_a)

$G_V=0\text{dB}$, $T_a=25^\circ\text{C}$



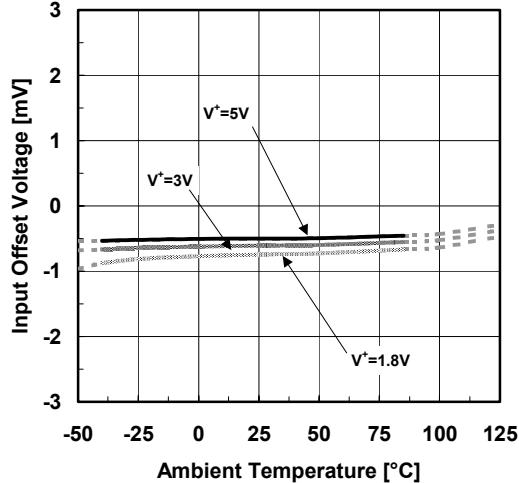
Operating Current
vs. Ambient Temperature

$G_V=0\text{dB}$



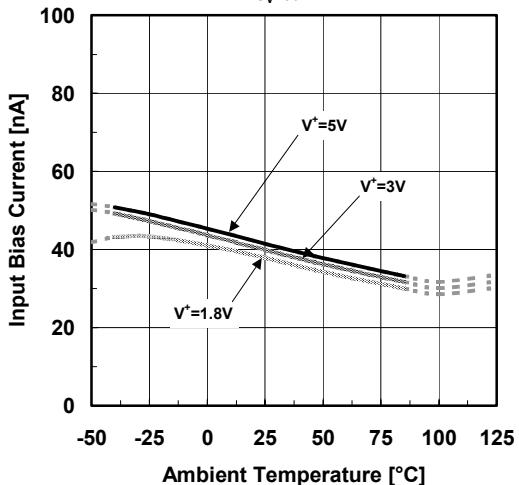
Input Offset Voltage
vs. Ambient Temperature

$G_V=0\text{dB}$



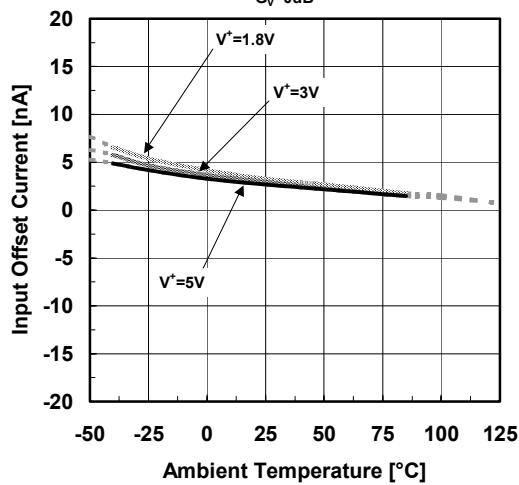
Input Bias Current
vs. Ambient Temperature

$G_V=0\text{dB}$

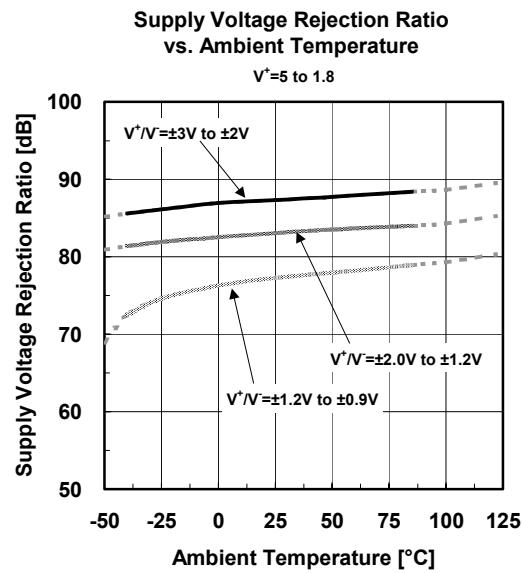
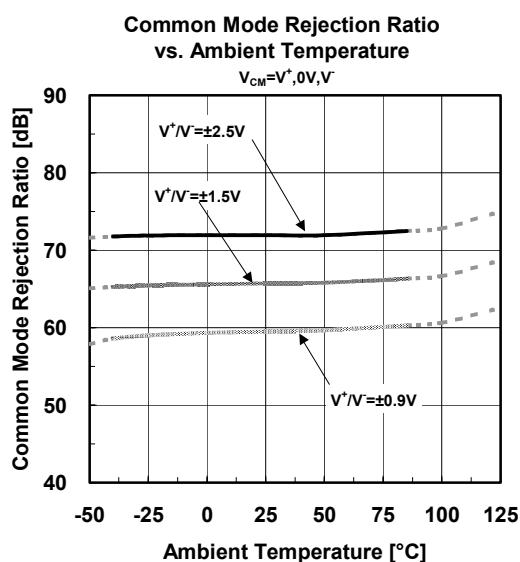
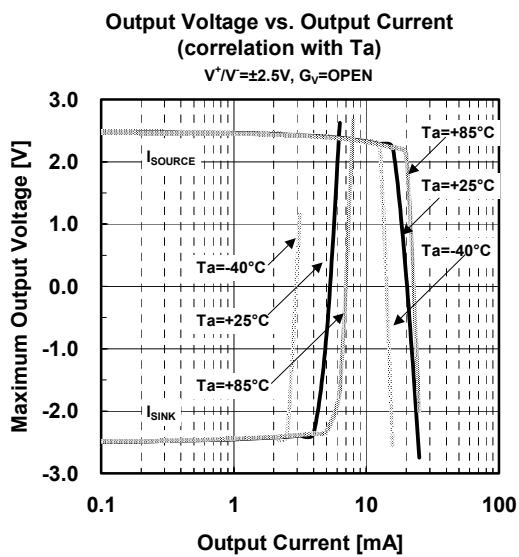
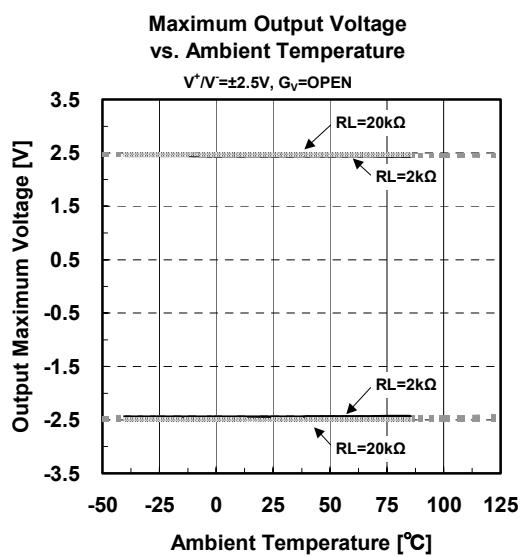
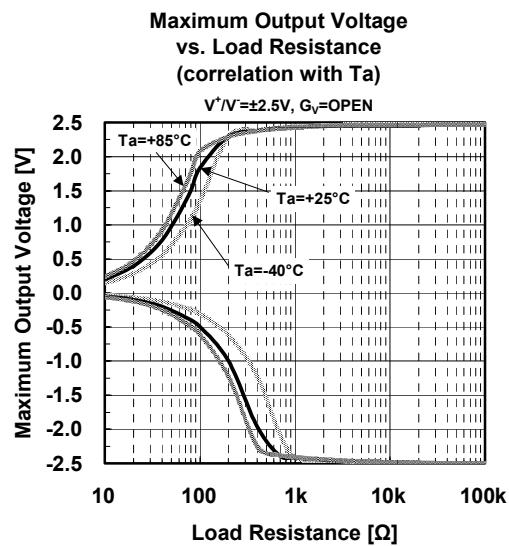
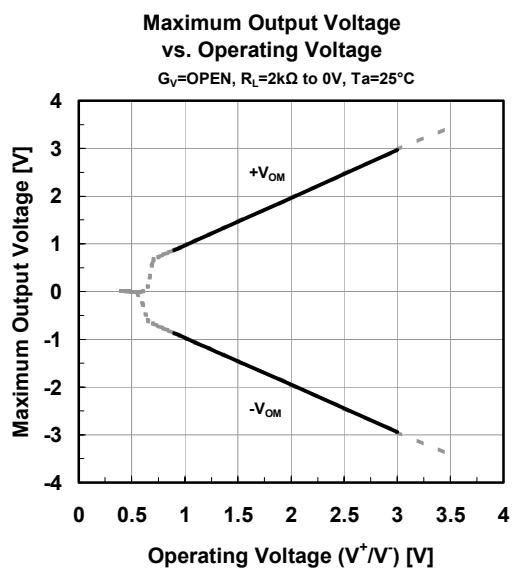


Input Offset Current
vs. Ambient Temperature

$G_V=0\text{dB}$

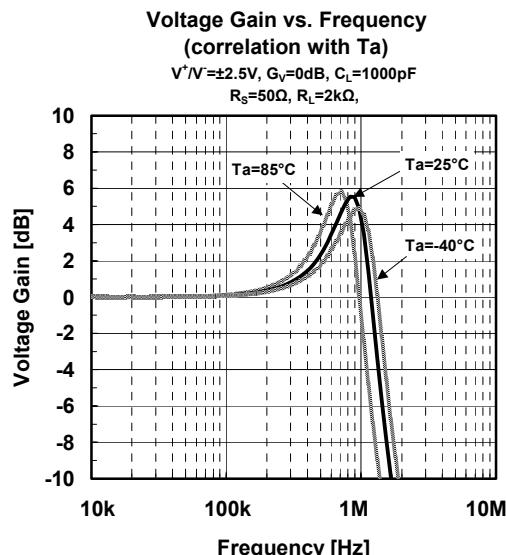
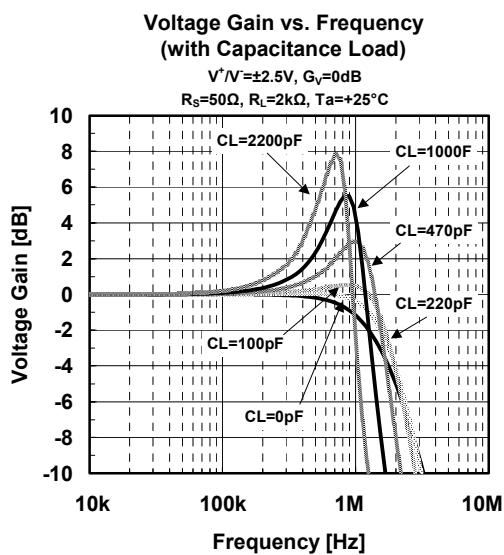
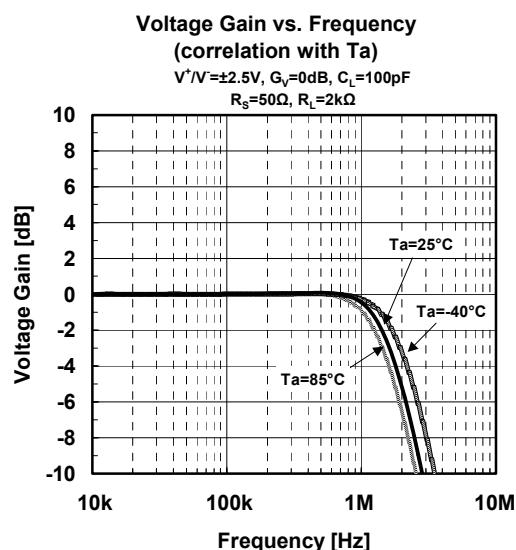
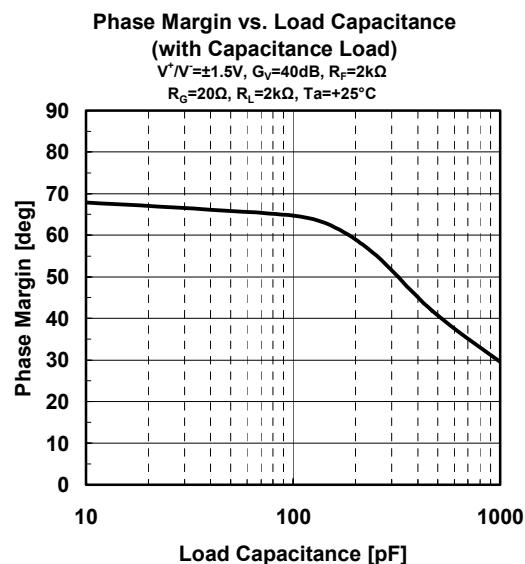
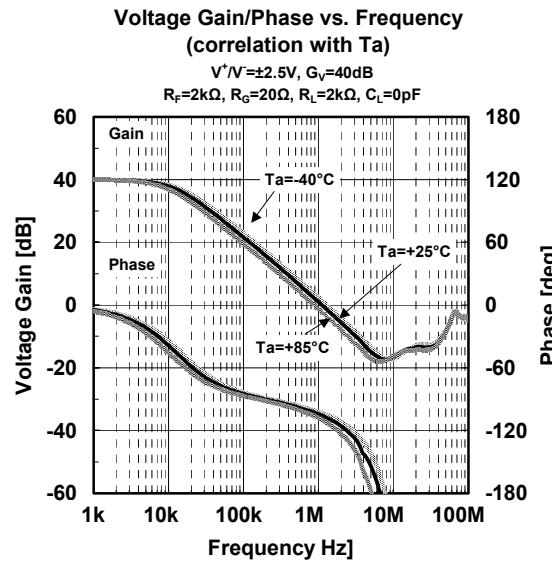
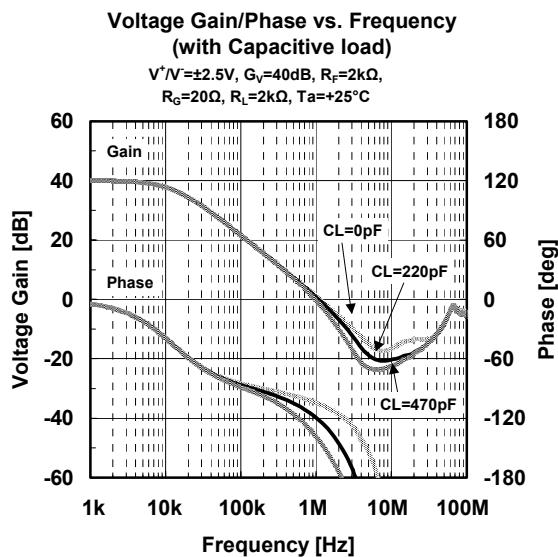


■ TYPICAL CHARACTERISTICS

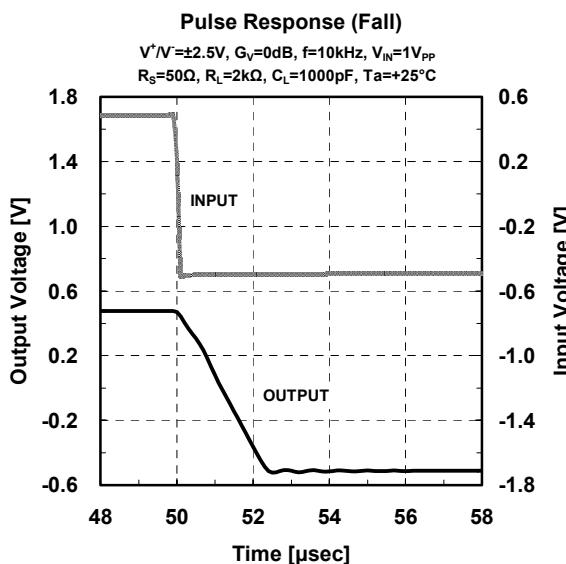
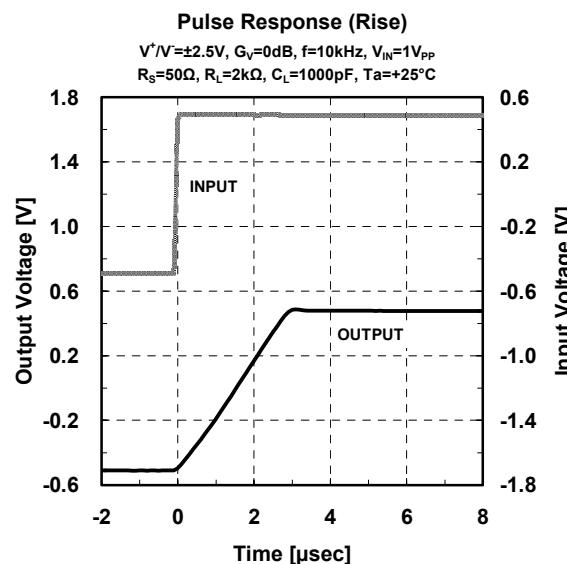
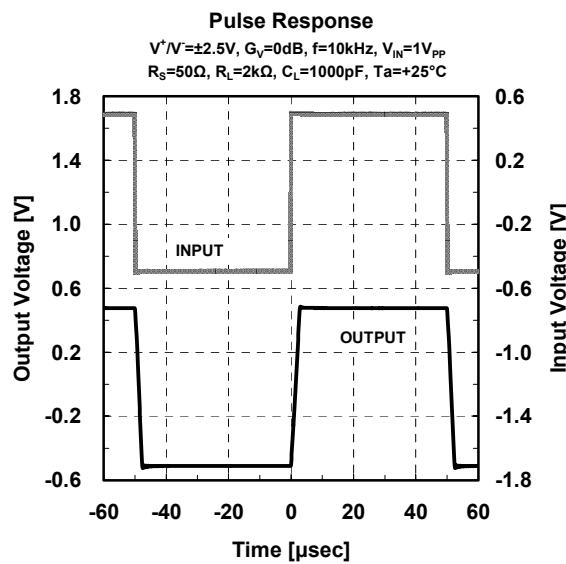
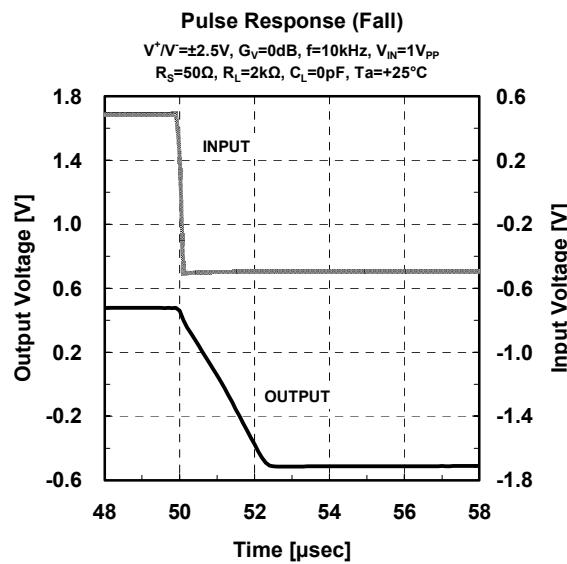
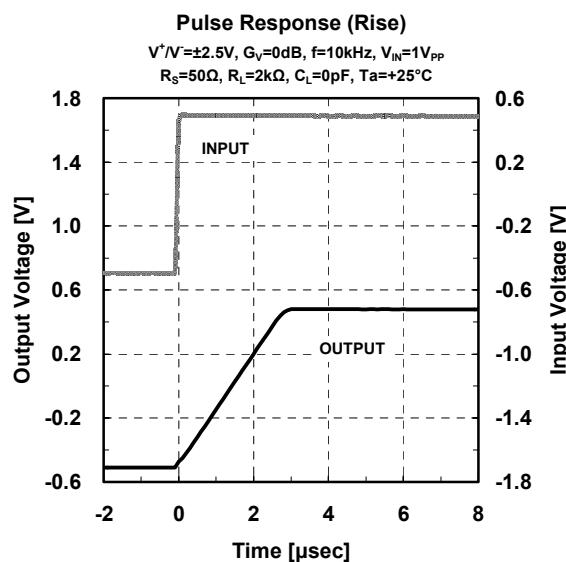
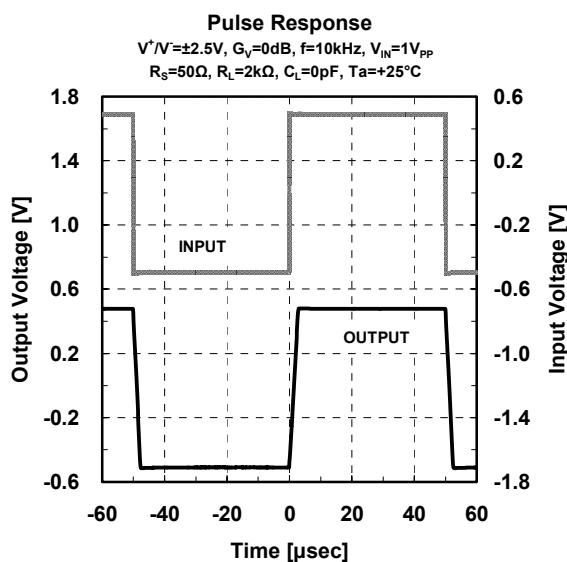


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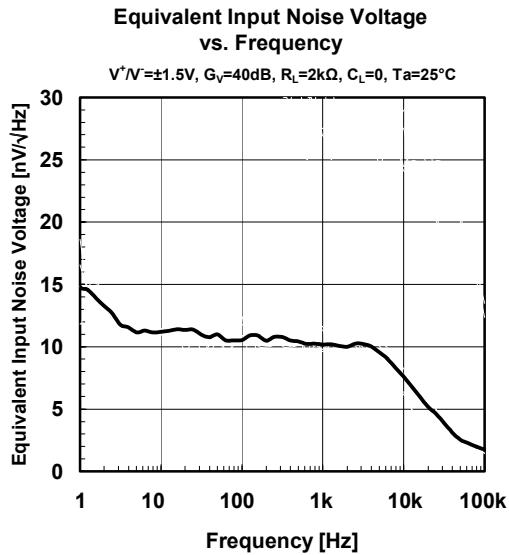
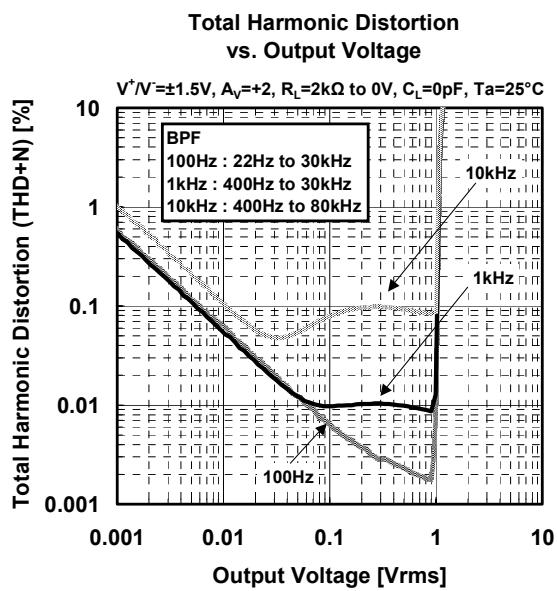
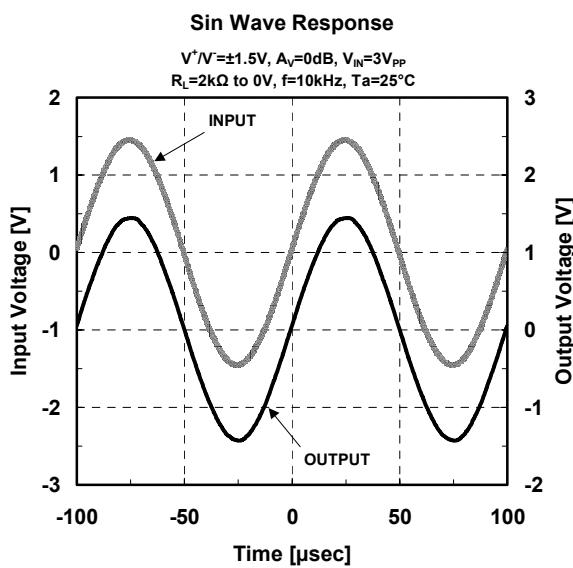


■ TYPICAL CHARACTERISTICS



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■ TYPICAL CHARACTERISTICS



[CAUTION]

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