

Rail-to-Rail Input/Output Dual Operational Amplifier

■ GENERAL DESCRIPTION

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

Rail-to-Rail Input/Output provides wide dynamic range, is from ground to power supply level. In addition to ground sensing applications, NJM8532 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



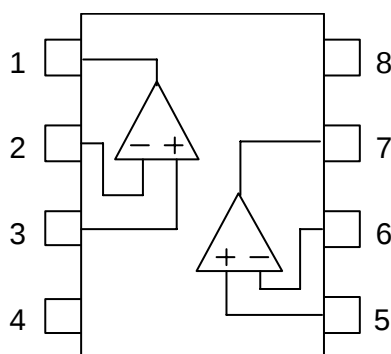
NJM8532RB1

■ 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 $V_{OH} \geq 4.9V$ / $V_{OL} \leq 0.1V$, 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. at $f = 1kHz$
- Adequate phase margin $\Phi_M = 75deg.$ typ., at $R_L = 2k\Omega$, voltage follower
- Bipolar Technology
- Package Outline TVSP8

■ PIN CONFIGURATION

(Top View)



PIN FUNCTION

- 1. A OUTPUT
- 2. A -INPUT
- 3. A +INPUT
- 4. GND
- 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	465 (Note2)	mW
Operating Temperature Range	T _{opr}	-40~+85	°C
Storage Temperature Range	T _{stg}	-40~+125	°C

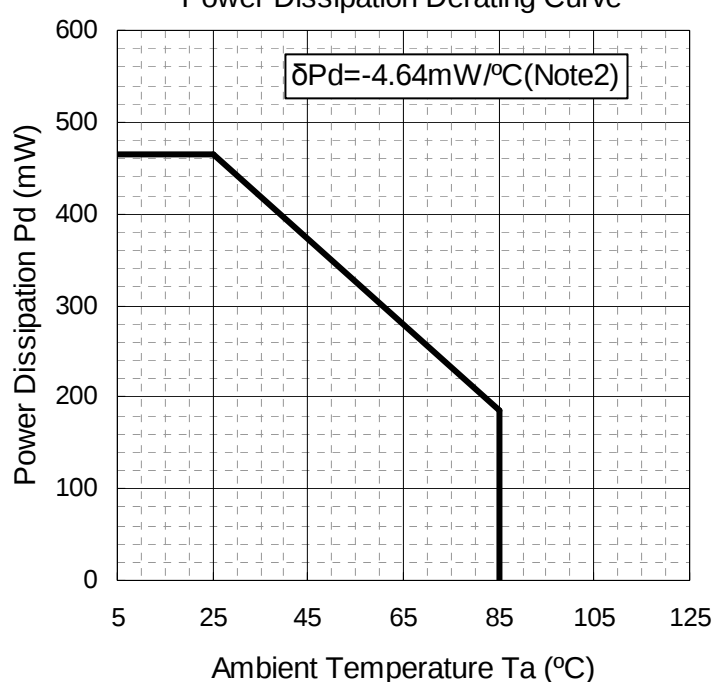
(Note1) For supply voltage less than 15V, the absolute maximum input voltage is equal to the supply voltage.

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

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

Figure1

Power Dissipation Derating Curve



■ RECOMMENDED OPERATING CONDITION

(Ta=25°C)

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

■ ELECTRICAL CHARACTERISTICS ($V^+=5V$, $T_a=25^\circ C$)

●DC CHARACTERISTICS

($V^+=5V$, $T_a=25^\circ C$)

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	$R_L=2k\Omega$	60	85	-	dB
Common Mode Rejection Ratio	CMR	CMR+: $2.5V \leq V_{CM} \leq 5V$ CMR-: $0V \leq V_{CM} \leq 2.5V$ (Note4)	55	70		dB
Supply Voltage Rejection Ratio	SVR	$V^+V = \pm 2.0V \sim \pm 3.0V$	70	85	-	dB
Maximum Output Voltage 1	V_{OH1}	$R_L=20k\Omega$	4.9	4.95	-	V
	V_{OL1}	$R_L=20k\Omega$	-	0.05	0.1	V
Maximum Output Voltage 2	V_{OH2}	$R_L=2k\Omega$	4.75	4.85	-	V
	V_{OL2}	$R_L=2k\Omega$	-	0.15	0.25	V
Input Common Mode Voltage Range	V_{ICM}	CMR ≥ 55 dB	0	-	5	V

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

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

●AC CHARACTERISTICS

($V^+=5V$, $T_a=25^\circ C$)

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

●TRANSIENT CHARACTERISTICS

($V^+=5V$, $T_a=25^\circ C$)

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

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■ ELECTRICAL CHARACTERISTICS ($V^+=3V$, $T_a=25^\circ C$)

●DC CHARACTERISTICS

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

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	$R_L=2k\Omega$	60	84	-	dB
Common Mode Rejection Ratio	CMR	CMR+: $1.5V \leq V_{CM} \leq 3V$ CMR-: $0V \leq V_{CM} \leq 1.5V$ (Note5)	48	63		dB
Supply Voltage Rejection Ratio	SVR	$V^+V = \pm 1.2V \sim \pm 2.0V$	68	83	-	dB
Maximum Output Voltage 1	V_{OH1}	$R_L=20k\Omega$	2.9	2.95	-	V
	V_{OL1}	$R_L=20k\Omega$	-	0.05	0.1	V
Maximum Output Voltage 2	V_{OH2}	$R_L=2k\Omega$	2.75	2.85	-	V
	V_{OL2}	$R_L=2k\Omega$	-	0.15	0.25	V
Input Common Mode Voltage Range	V_{ICM}	CMR ≥ 48 dB	0	-	3	V

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

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

●AC CHARACTERISTICS

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

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

●TRANSIENT CHARACTERISTICS

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

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

■ ELECTRICAL CHARACTERISTICS ($V^+=1.8V$, $T_a=25^\circ C$)

●DC CHARACTERISTICS

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

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	$R_L=2k\Omega$	60	83	-	dB
Common Mode Rejection Ratio	CMR	CMR+: $0.9V \leq V_{CM} \leq 1.8V$ CMR-: $0V \leq V_{CM} \leq 0.9V$ (Note6)	48	55		dB
Supply Voltage Rejection Ratio	SVR	$V^+V = \pm 1.2V \sim \pm 2.0V$	65	80	-	dB
Maximum Output Voltage 1	V_{OH1}	$R_L=20k\Omega$	1.7	1.75	-	V
	V_{OL1}	$R_L=20k\Omega$	-	0.05	0.1	V
Maximum Output Voltage 2	V_{OH2}	$R_L=2k\Omega$	1.55	1.65	-	V
	V_{OL2}	$R_L=2k\Omega$	-	0.15	0.25	V
Input Common Mode Voltage Range	V_{ICM}	CMR ≥ 40 dB	0	-	1.8	V

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

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

●AC CHARACTERISTICS

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

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

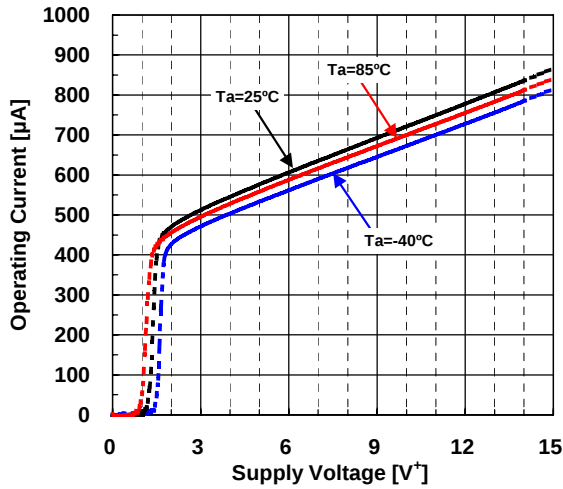
●TRANSIENT CHARACTERISTICS

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

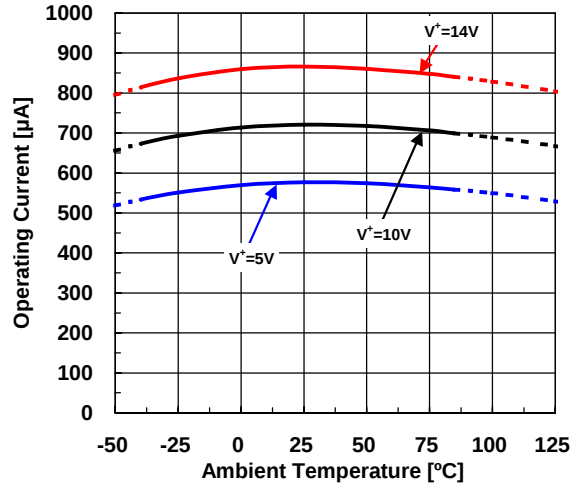
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	$R_L=2k\Omega$	-	0.3	-	V/ μs

■ TYPICAL CHARACTERISTICS

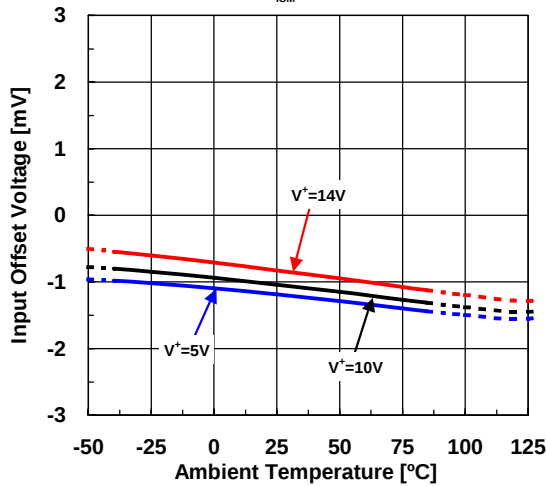
Supply Current vs. Supply Voltage
(correlation with T_a)
 $G_V=0\text{dB}$



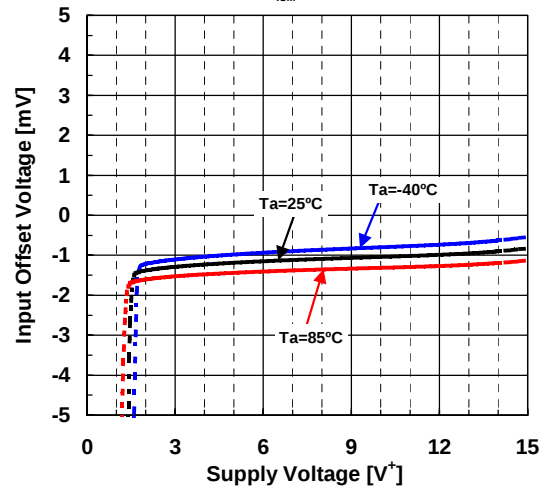
Supply Current vs. Ambient Temperature
 $G_V=0\text{dB}$



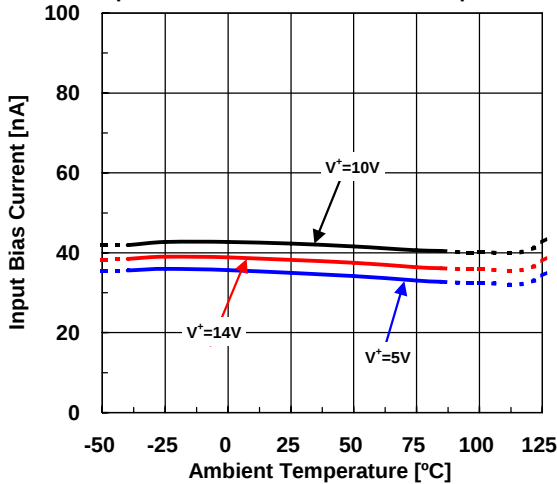
Input Offset Voltage vs. Ambient Temperature
 $V_{\text{ICM}}=1/2V^+$



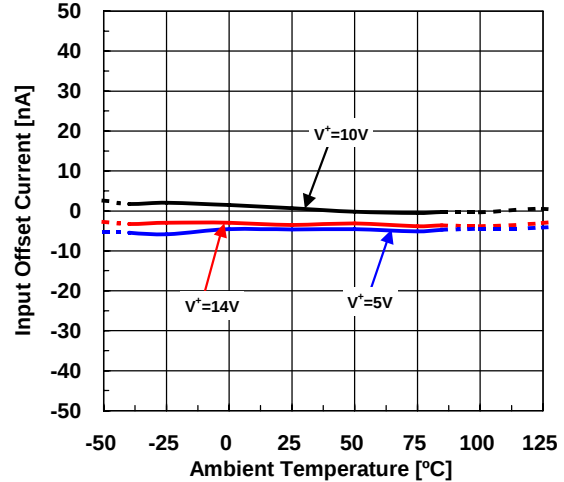
Input Offset Voltage vs. Supply Voltage
(correlation with T_a)
 $V_{\text{ICM}}=1/2V^+$



Input Bias Current vs. Ambient Temperature

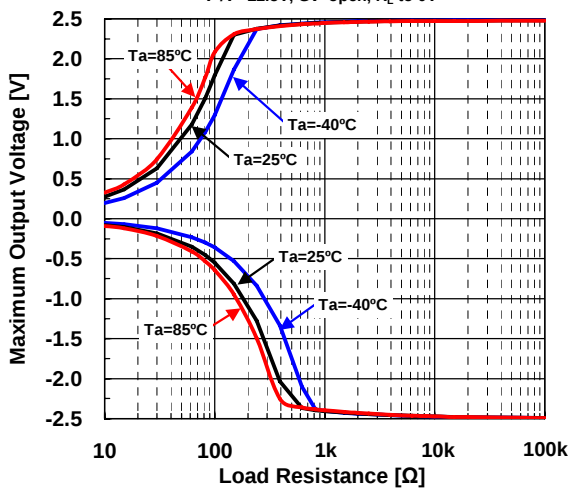


Input Offset Current vs. Ambient Temperature

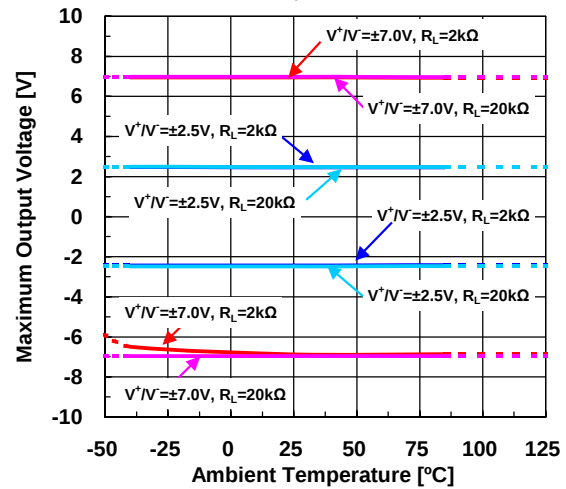


■ TYPICAL CHARACTERISTICS

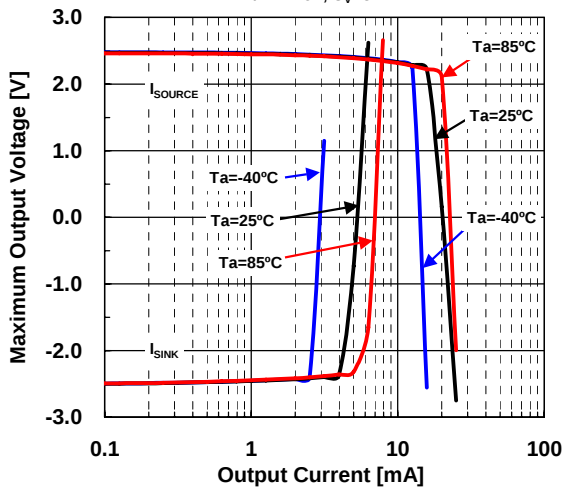
Maximum Output Voltage vs. Load Resistance
(correlation with T_a)
 $V^+/V^- = \pm 2.5V$, $G_v = \text{open}$, R_L to 0V



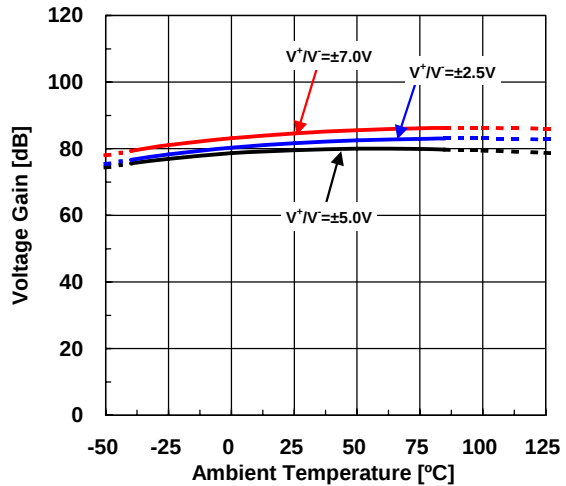
Maximum Output Voltage vs. Ambient Temperature
 $G_v = \text{open}$, R_L to 0V



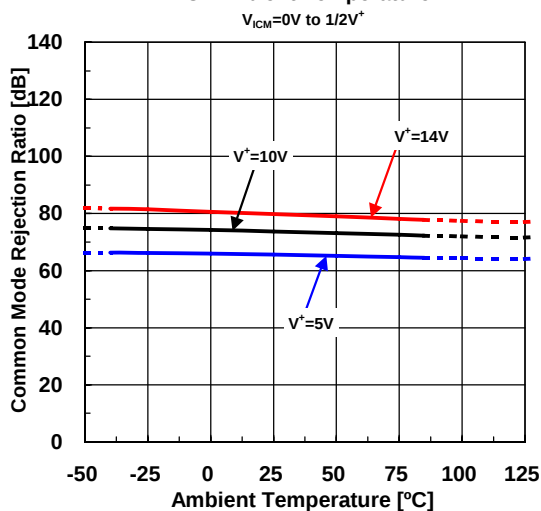
Maximum Output Voltage vs. Output Current
(correlation with T_a)
 $V^+/V^- = \pm 2.5V$, $G_v = \text{OPEN}$



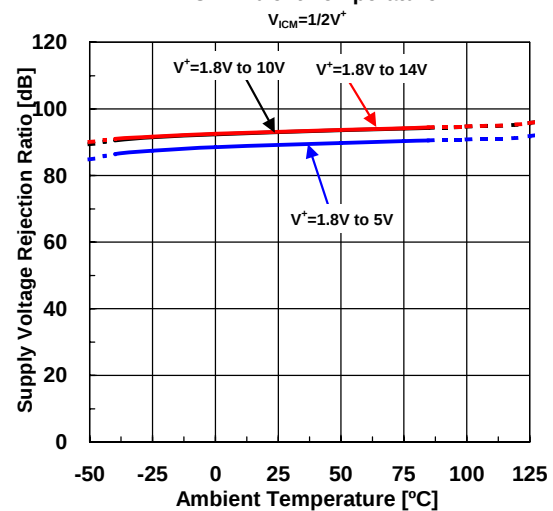
Voltage Gain vs. Ambient Temperature
 $R_L = 2k\Omega$ to 0V



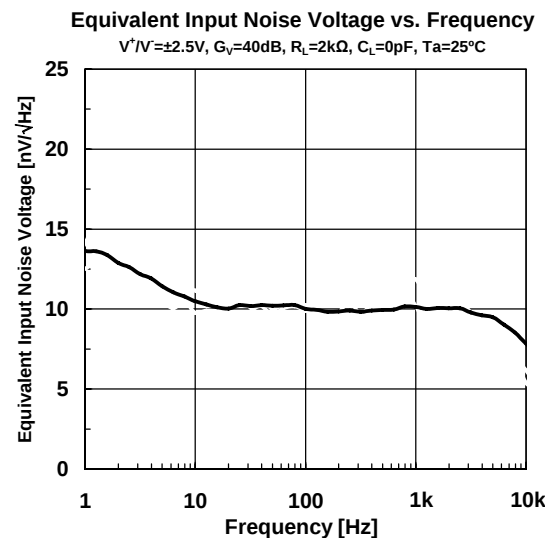
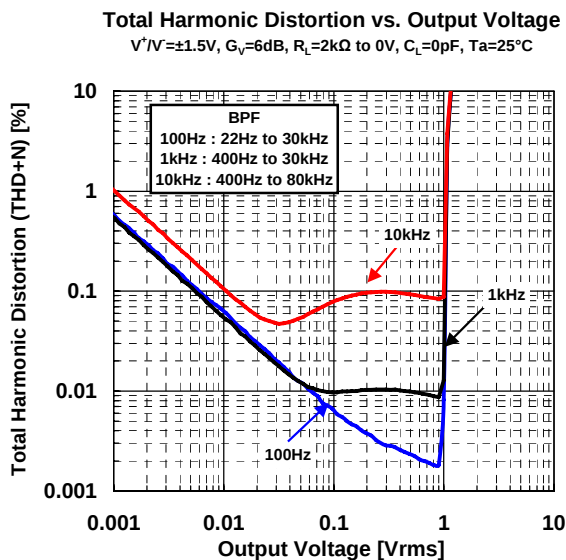
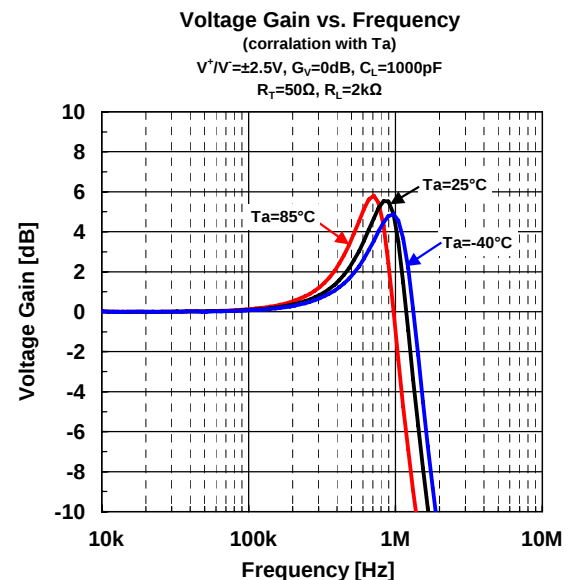
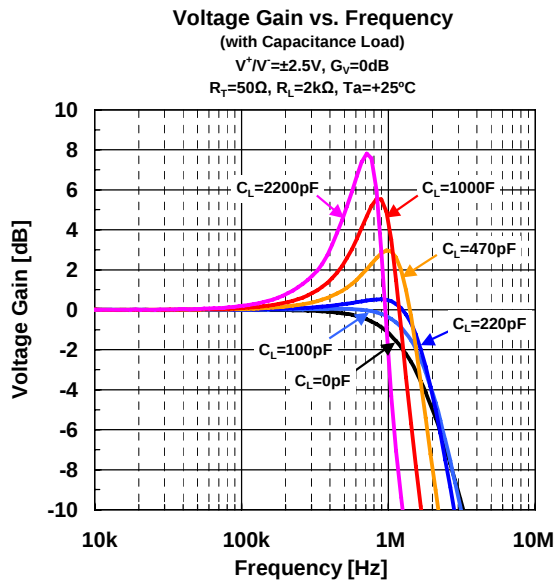
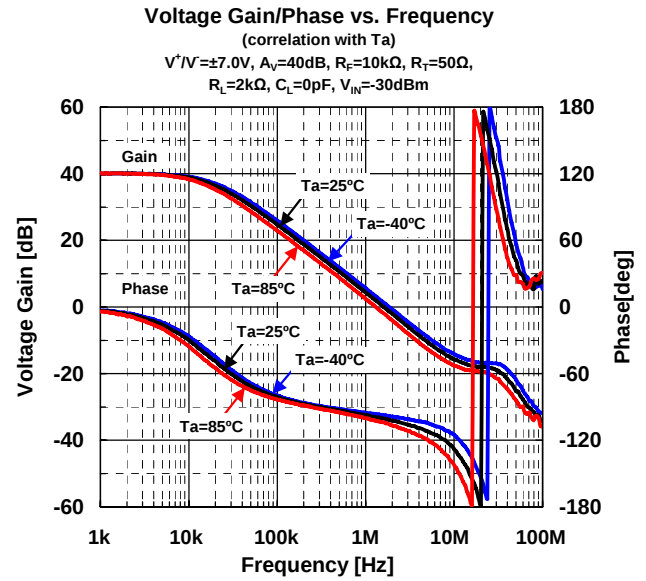
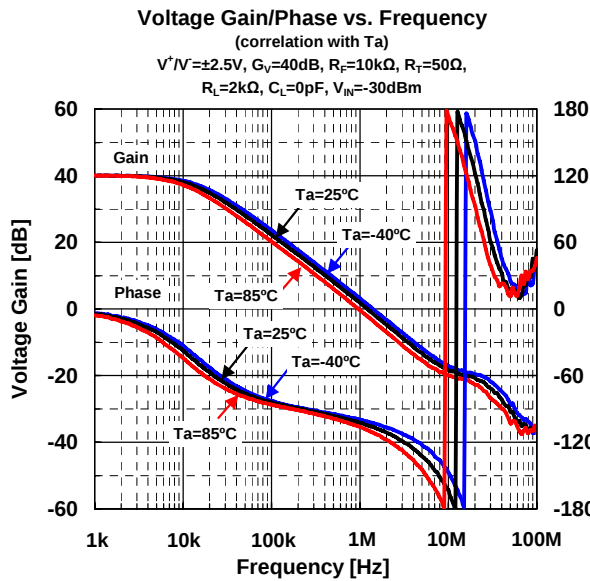
Common Mode Rejection Ratio
vs. Ambient Temperature
 $V_{ICM} = 0V$ to $1/2V^+$



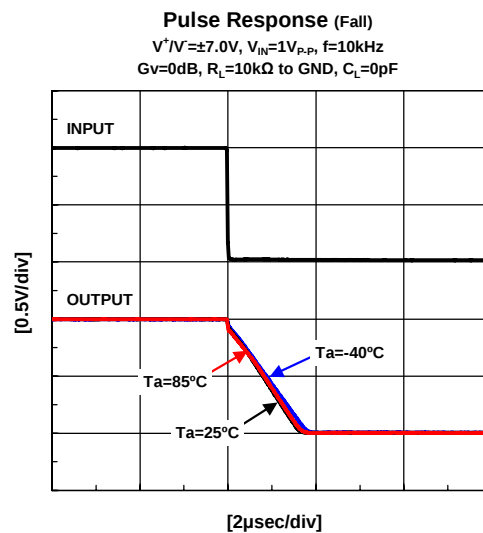
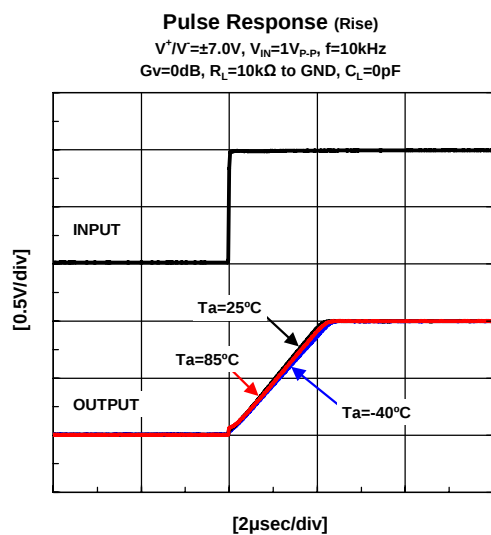
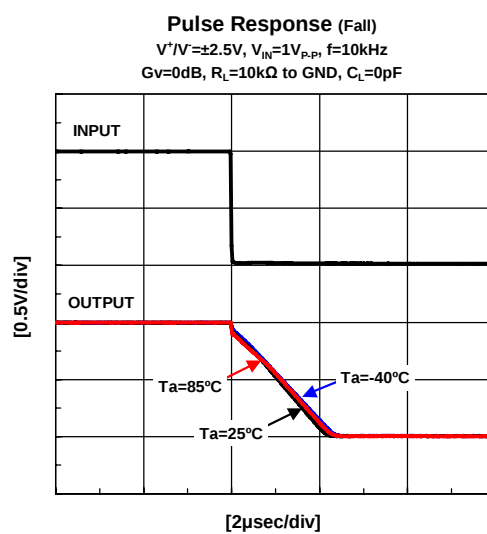
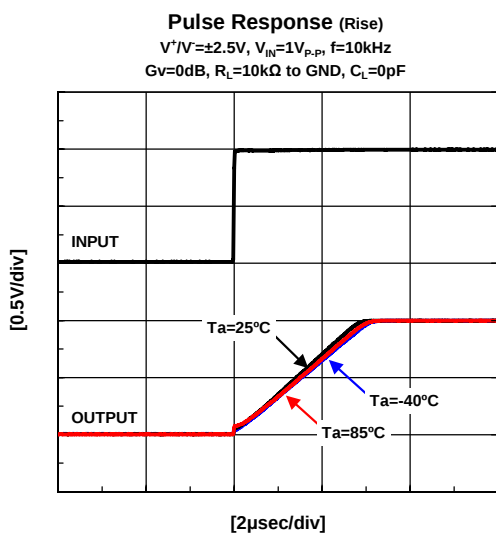
Supply Voltage Rejection Ratio
vs. Ambient Temperature
 $V_{ICM} = 1/2V^+$



■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS



[CAUTION]

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