Rail-to-Rail Output, High Quality Audio, Dual Operational Amplifier

■ GENERAL DESCRIPTION

The MUSES8832 is a Rail-to-Rail output High quality audio operational amplifier, which is optimized for high-end audio and portable audio applications.

The MUSES8832 features 2.1nV/√Hz low noise, 10MHz wide gain bandwidth, 0.0009% low distortion, 600Ω drive capability, -40°C to +125°C operating temperature range, and various reliabilities and conveniences are improved.

It is the best for audio preamplifiers, active filters, microphone amplifiers, and line amplifiers with excellent sound.

■ PACKAGE OUTLINE

MUSES8832E
(SOP8 JEDEC 150 mil)

MUSES8832VA3
(SSOP8-A3)

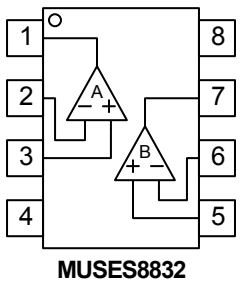
■ APPLICATIONS

- Home Audio
- PC Audio
- Portable Audio
- Car Audio

■ FEATURES

● Operating Voltage	+2.7V to +14V ±1.35V to ±7.0V
● Low Noise	2.1nV/√Hz typ. at f=1kHz 0.3μVrms typ. (20Hz to 20kHz)
● Output Current	32mA typ. (Capability of driving 600Ω loads)
● GBW	10MHz typ.
● Low Distortion	0.0009% typ. at V+=+5V, Vo=1.3Vrms
● Slew Rate	1V/μs typ.
● Bipolar Technology	
● Package Outline	SOP8 JEDEC 150 mil, SSOP8-A3
● Operating Temperature Range	-40 to +125°C

■ PIN CONFIGURATION



PIN FUNCTION

1. A OUTPUT
2. A -INPUT
3. A +INPUT
4. V-
5. B +INPUT
6. B -INPUT
7. B OUTPUT
8. V+

■ **ABSOLUTE MAXIMUM RATINGS** (Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V^+ (V^+/V^-)	+15 (±7.5)	V
Input Voltage	V_{IN}	+15 (Note1)	V
Differential Input Voltage	V_{ID}	±15	V
Power Dissipation	P_D	SOP8 JEDEC 150 mil: 900 SSOP8-A3: 650(Note2)	mW
Operating Temperature Range	T_{opr}	-40 to +125	°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

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

■ **RECOMMENDED OPERATING CONDITION** (Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V^+		+2.7	-	+14.0	V
	V^+/V^-		±1.35	-	±7.0	V

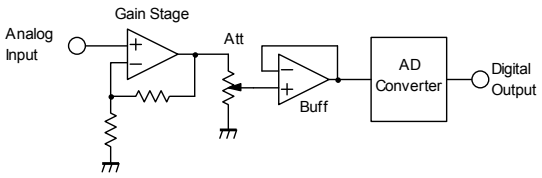
■ **ELECTRIC CHARACTERISTICS**
V^+= +5V, V^-=0V, Ta=25°C, R_L to V^+/2, unless otherwise specified

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current	I_{CC}	No Signal, R_L=∞	-	7.5	10	mA
Power Dissipation	P_D	No Signal	-	42.5	60	mW
Input Offset Voltage	V_{IO}	Rs=50Ω	-	0.1	0.5	mV
Input Bias Current	I_B		-	4	6.5	μA
Input Offset Current	I_{IO}		-	100	500	nA
Open-Loop Voltage Gain	A_V	R_L=10kΩ to V+/2, V_O=0.5 to 4.5V	90	115	-	dB
Common Mode Input Voltage Range	V_{ICM}	CMR≥90dB	0.5	-	3.7	V
Common Mode Rejection Ratio	CMR	R_S=50Ω	90	110	-	dB
Supply Voltage Rejection Ratio	SVR	R_S=50Ω	90	105	-	dB
Maximum Output Voltage 1	V_{OH1}	R_L =10kΩ to 0V	4.9	4.95	-	V
	V_{OL1}	R_L =10kΩ to 0V	-	0.05	0.1	V
Maximum Output Voltage 2	V_{OH2}	R_L =600Ω to V^+/2	4.8	4.9	-	V
	V_{OL2}	R_L =600Ω to V^+/2	-	0.1	0.2	V
Output Source Current	I_{SOURCE}	V_O=V^+-0.5V	10	32	-	mA
Output Sink Current	I_{SINK}	V_O=0.5V	10	20	-	mA
Gain Bandwidth Product	GBW	f=10kHz	-	10	-	MHz
Slew Rate	SR	R_L=2kΩ	-	1	-	V/μs
Total Harmonic Distortion + Noise	THD+N	Gain=10,V_O=1.3Vrms,R_L=2kΩ,f=1kHz	-	0.0009	-	%
Channel Separation	CS	Gain=100, R_S=1kΩ, R_L=10kΩ, f=1kHz	-	140	-	dB
Input Noise Voltage1	e_n	f=1kHz	-	2.1	-	nV/√Hz
Input Noise Voltage2	V_n	f=20Hz to 20kHz	-	0.30	-	μVrms

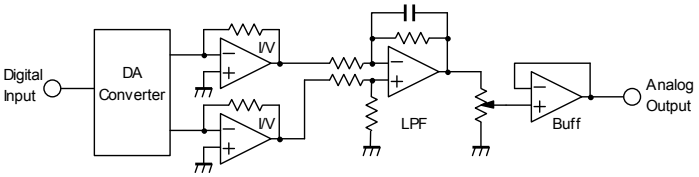
■ **NOTE**

1. The closed gain should be 6dB or higher to prevent the oscillation. Unity gain follower application may cause the oscillation.
2. Minimize the load capacitor for the better performance. A large load capacitor CL reduces the frequency response and causes oscillation or ringing.
3. Be careful to the circuit of high impedance. Input bias current influences an input noise and output offset voltage.

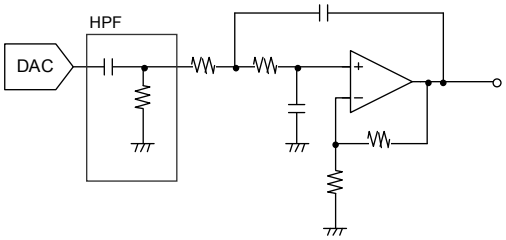
■ **APPLICATION CIRCUIT**



(Fig.1: ADC Input)



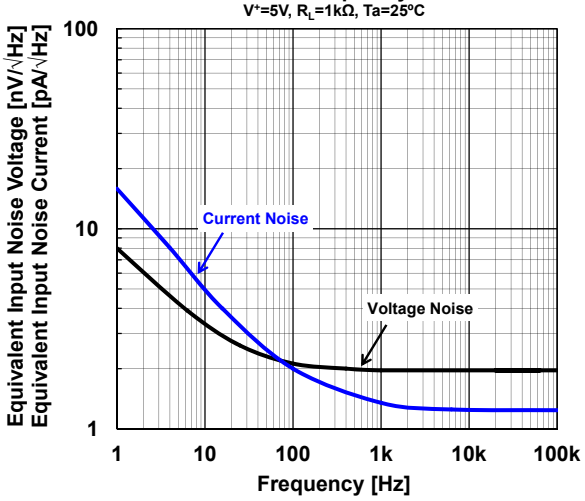
(Fig.2:DAC Output)



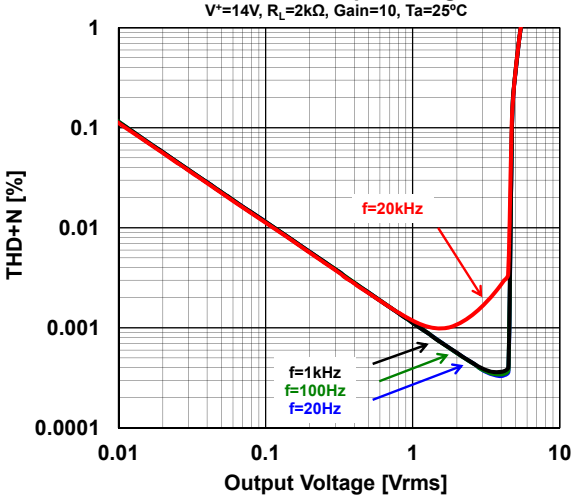
(Fig.3:DAC LPF Circuit)

■ **TYPICAL CHARACTERISTICS** (V^-=0V, V_{CM}=V^+/2, unless otherwise specified)

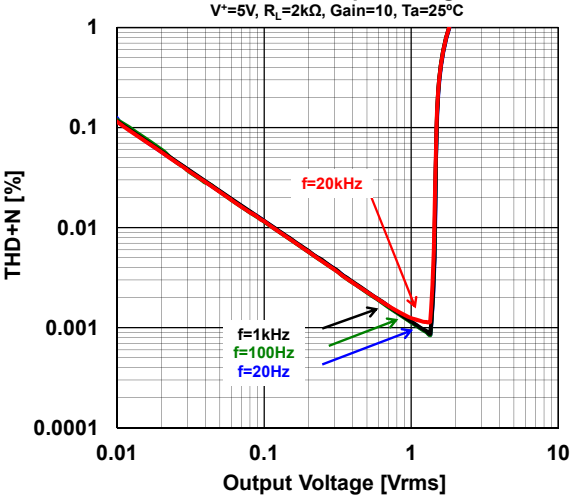
Voltage Noise Density / Current Noise Density vs. Frequency
V^+=5V, R_L=1kΩ, Ta=25°C



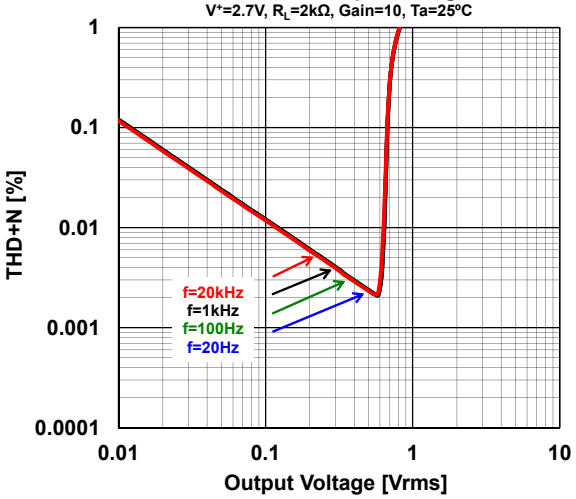
THD+N vs. Output Voltage
V^+=14V, R_L=2kΩ, Gain=10, Ta=25°C



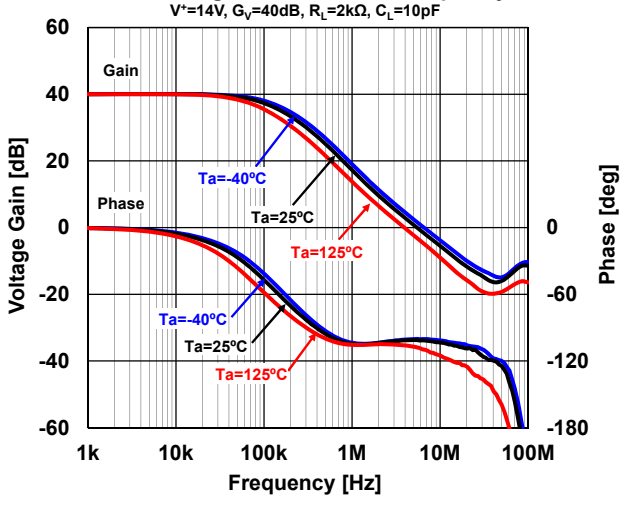
THD+N vs. Output Voltage
V^+=5V, R_L=2kΩ, Gain=10, Ta=25°C



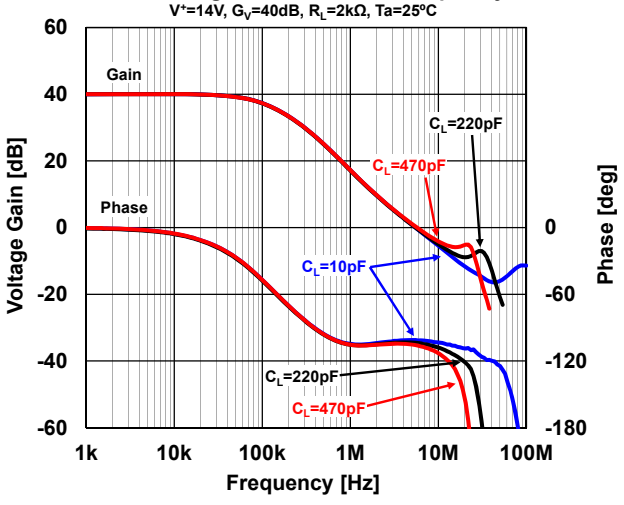
THD+N vs. Output Voltage
V^+=2.7V, R_L=2kΩ, Gain=10, Ta=25°C



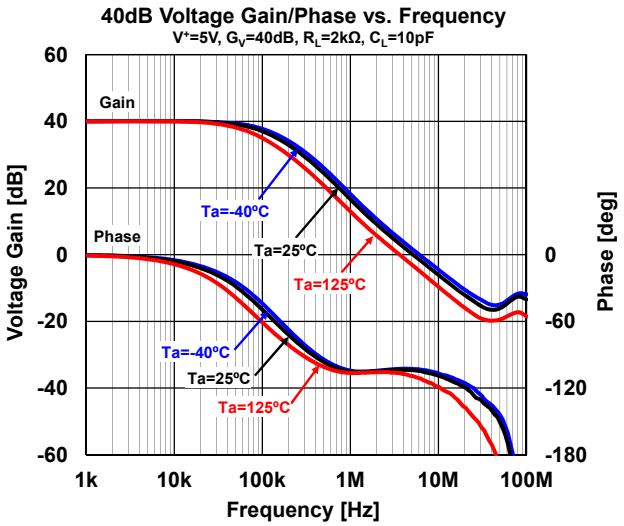
40dB Voltage Gain/Phase vs. Frequency
V^+=14V, G_V=40dB, R_L=2kΩ, C_L=10pF

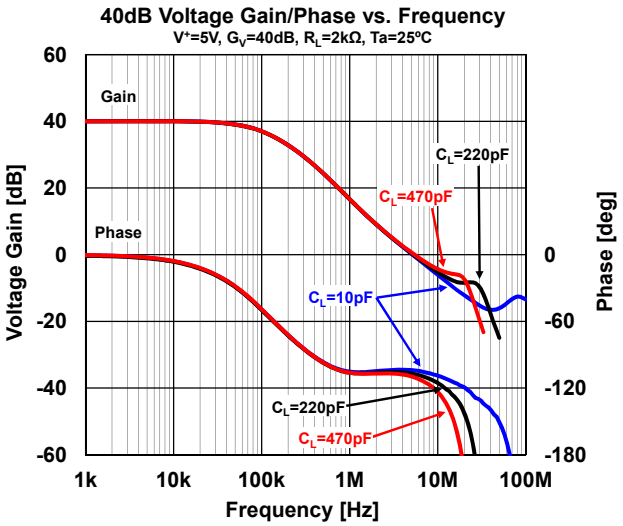


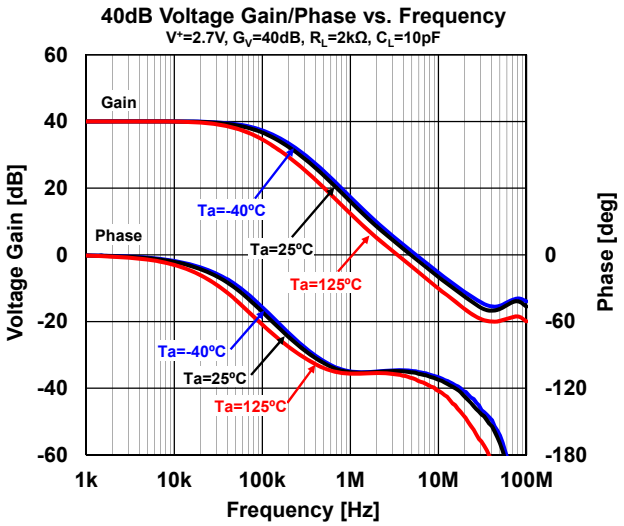
40dB Voltage Gain/Phase vs. Frequency
V^+=14V, G_V=40dB, R_L=2kΩ, Ta=25°C

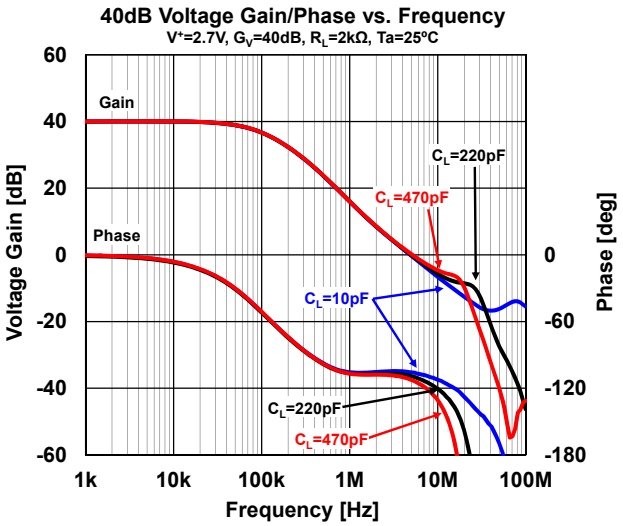


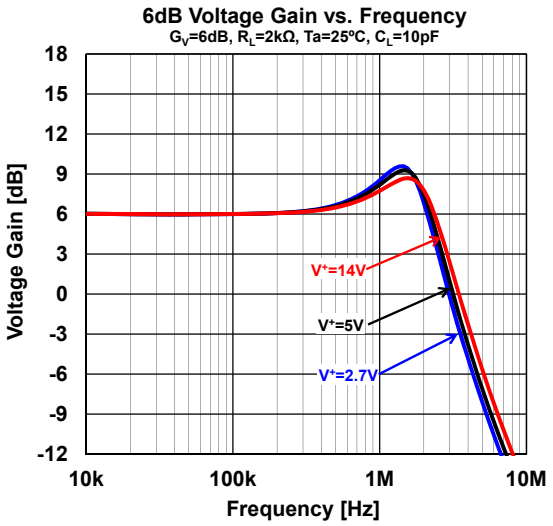
■ **TYPICAL CHARACTERISTICS** (V^-=0V, V_{CM}=V^+/2, unless otherwise specified)

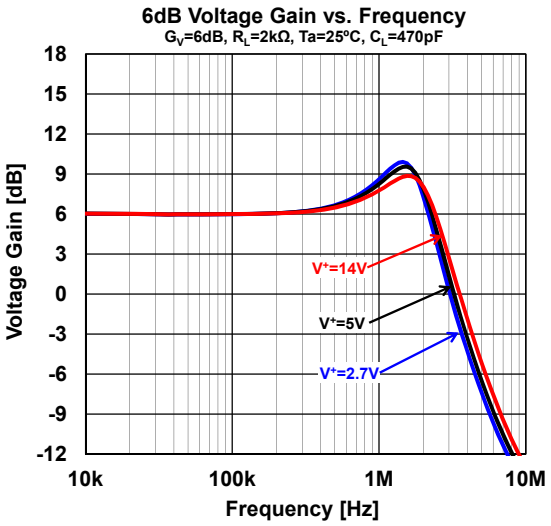






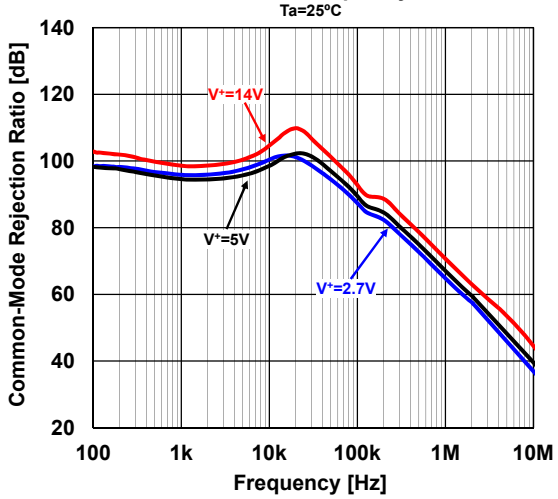




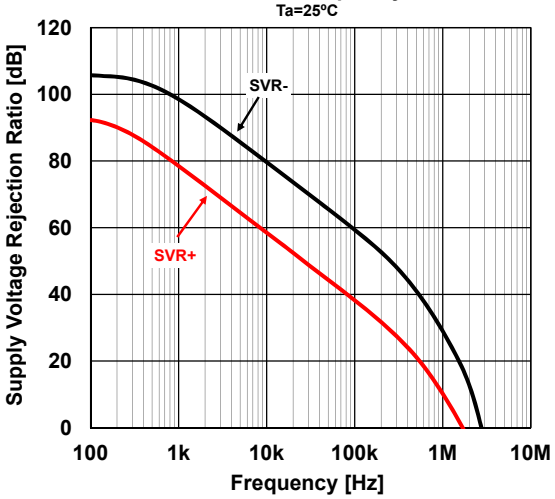


■ **TYPICAL CHARACTERISTICS** (V^-=0V, V_{CM}=V^+/2, unless otherwise specified)

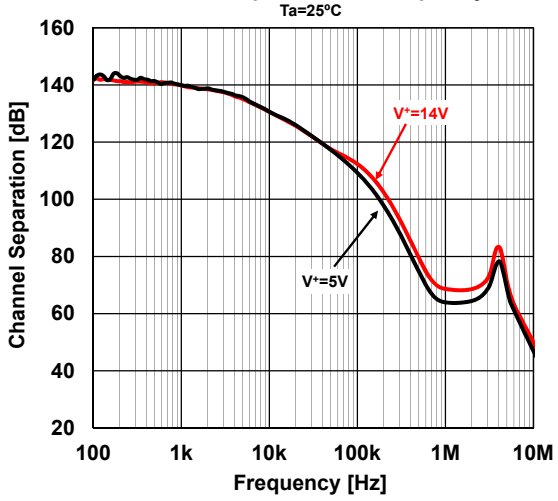
CMR vs. Frequency
Ta=25°C



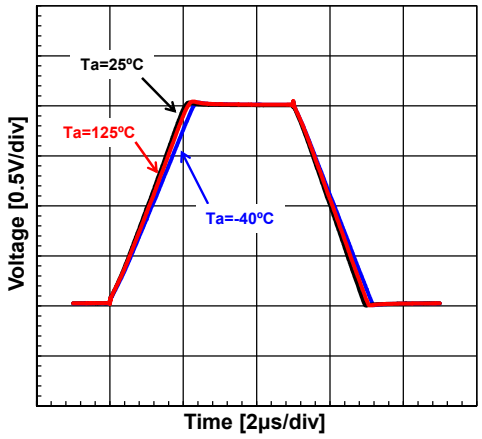
SVR vs. Frequency
Ta=25°C



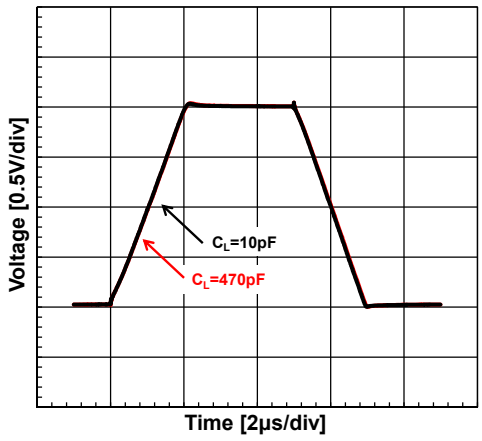
Channel Separation vs. Frequency
Ta=25°C



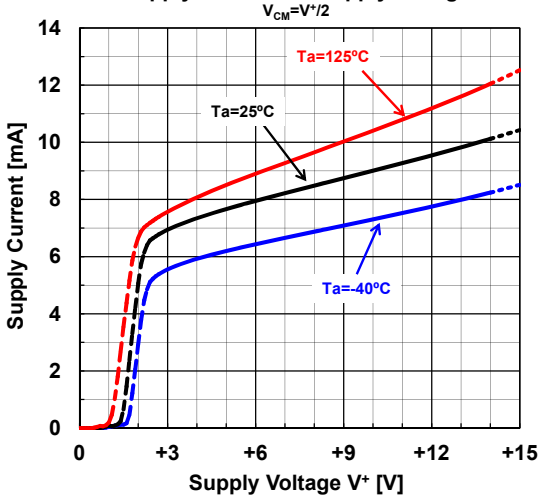
Pulse Response
V+=5V, Gain=+1, RL=2kΩ, CL=10pF



Pulse Response
V+=5V, Gain=+1, RL=2kΩ, Ta=25°C

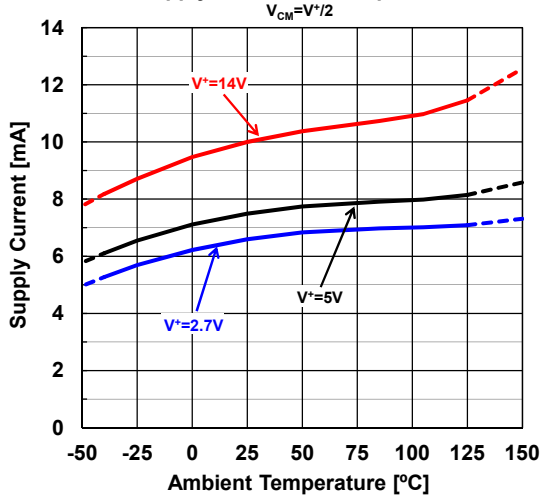


Supply Current vs. Supply Voltage
VCM=V+/2

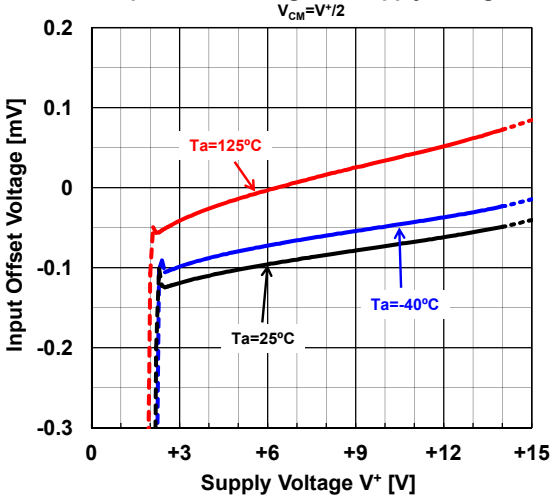


■ **TYPICAL CHARACTERISTICS** (V^-=0V, V_{CM}=V^+/2, unless otherwise specified)

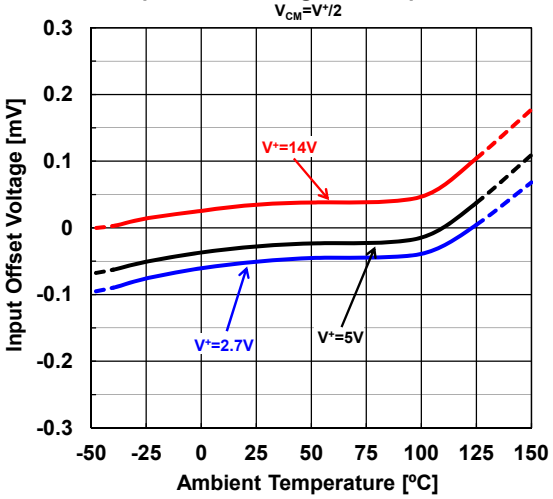
Supply Current vs. Temperature
V_{CM}=V^+/2



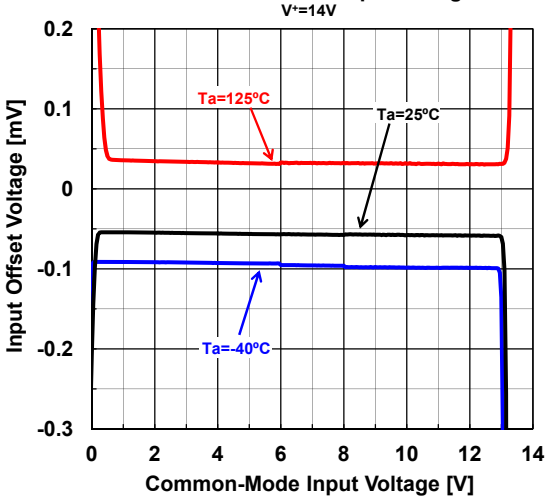
Input Offset Voltage vs. Supply Voltage
V_{CM}=V^+/2



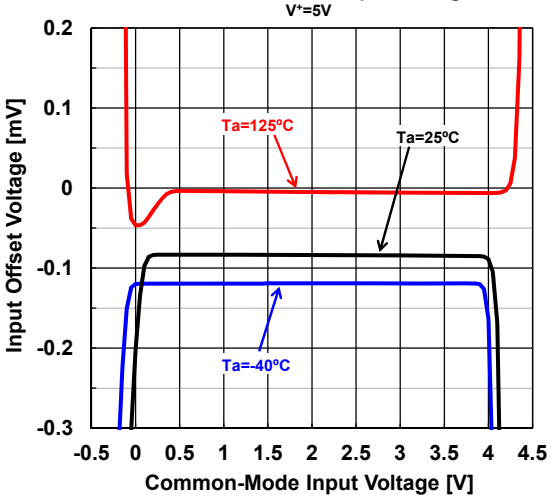
Input Offset Voltage vs. Temperature
V_{CM}=V^+/2



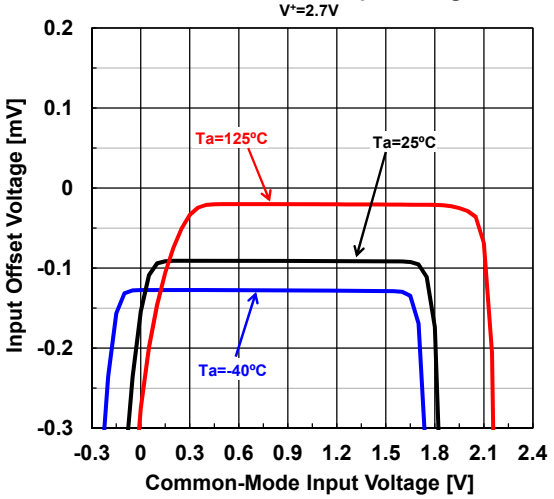
Input Offset Voltage
vs. Common-Mode Input Voltage
V^+=14V



Input Offset Voltage
vs. Common-Mode Input Voltage
V^+=5V

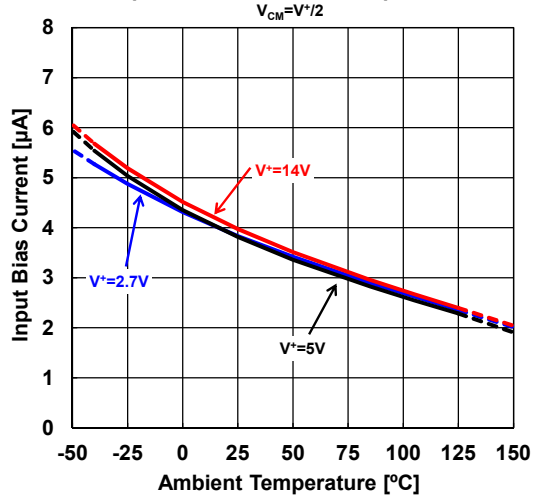


Input Offset Voltage
vs. Common-Mode Input Voltage
V^+=2.7V

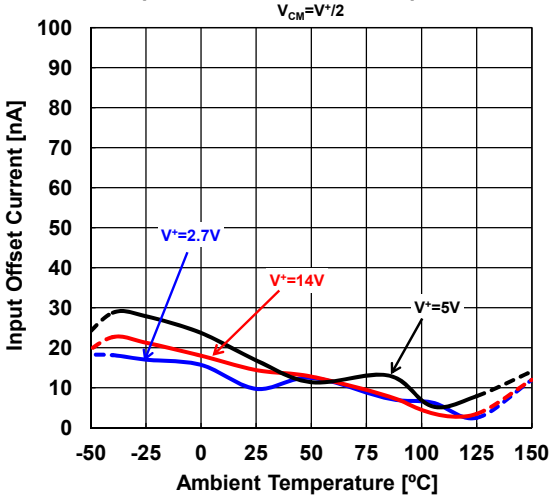


■ **TYPICAL CHARACTERISTICS** (V^-=0V, V_{CM}=V^+/2, unless otherwise specified)

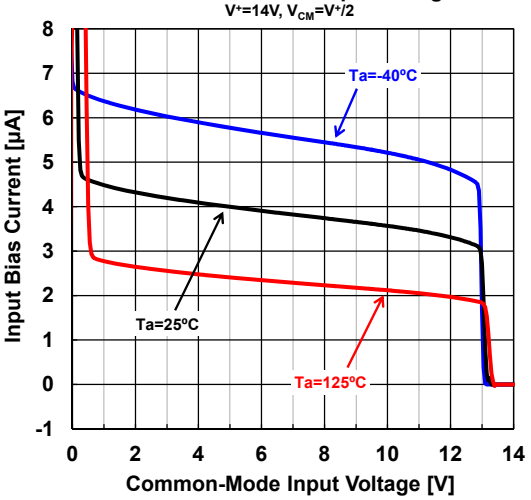
Input Bias Current vs. Temperature
V_{CM}=V^+/2



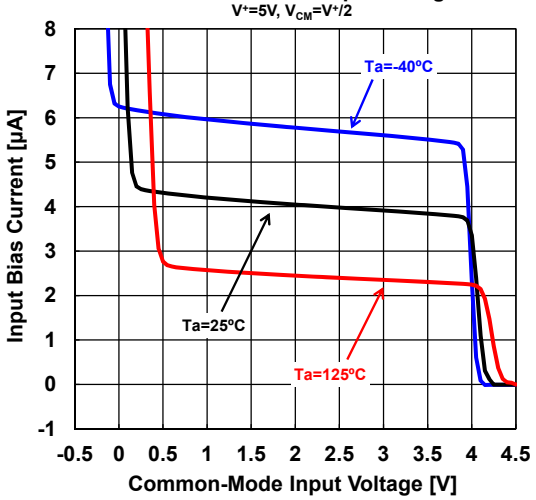
Input Offset Current vs. Temperature
V_{CM}=V^+/2



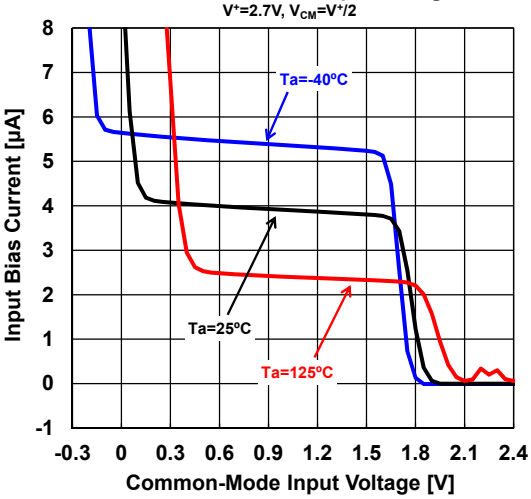
Input Bias Current
vs. Common-Mode Input Voltage
V^+=14V, V_{CM}=V^+/2



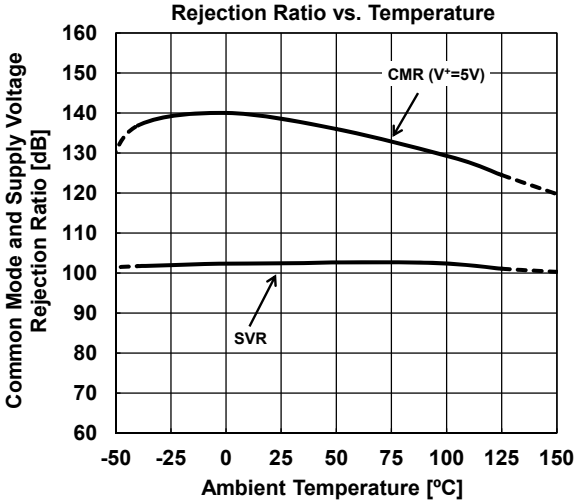
Input Bias Current
vs. Common-Mode Input Voltage
V^+=5V, V_{CM}=V^+/2



Input Bias Current
vs. Common-Mode Input Voltage
V^+=2.7V, V_{CM}=V^+/2

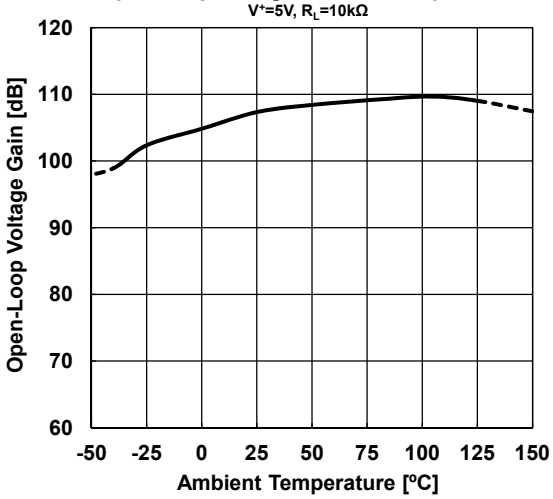


Common Mode and Supply Volrage
Rejection Ratio vs. Temperature

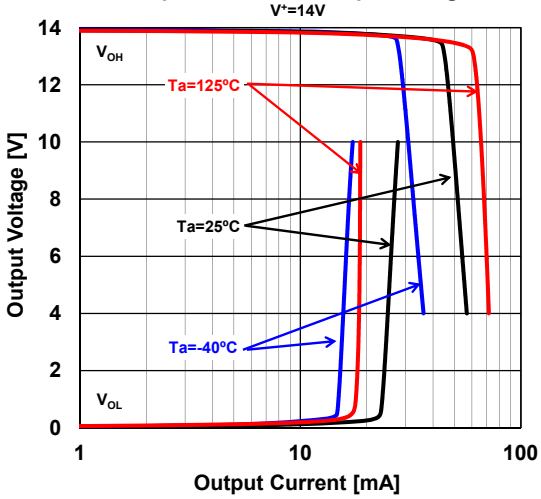


■ **TYPICAL CHARACTERISTICS** (V^-=0V, V_{CM}=V^+/2, unless otherwise specified)

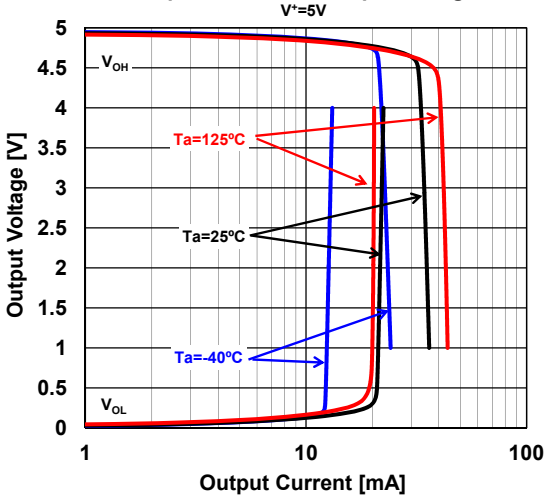
Open-Loop Voltage Gain vs. Temperature
V^+=5V, R_L=10kΩ



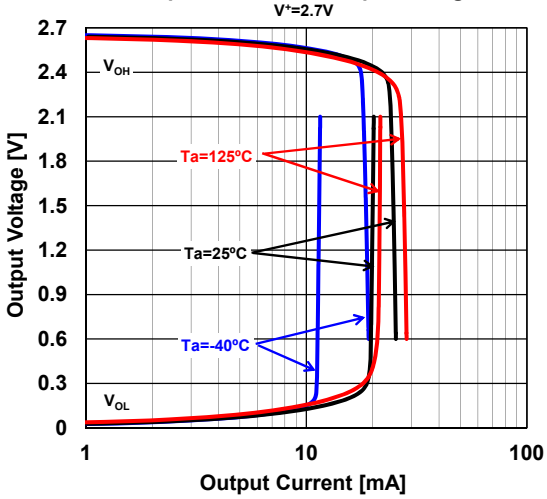
Output Current vs. Output Voltage
V^+=14V



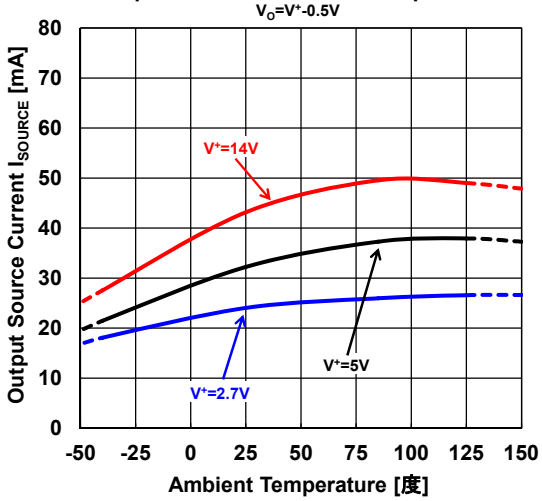
Output Current vs. Output Voltage
V^+=5V



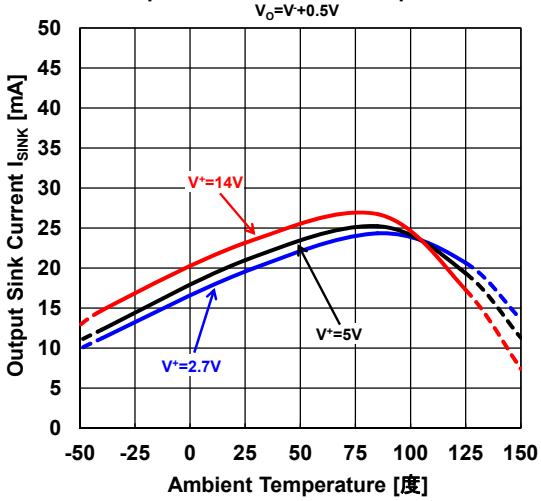
Output Current vs. Output Voltage
V^+=2.7V



Output Source Current vs. Temperature
V_O=V^+-0.5V

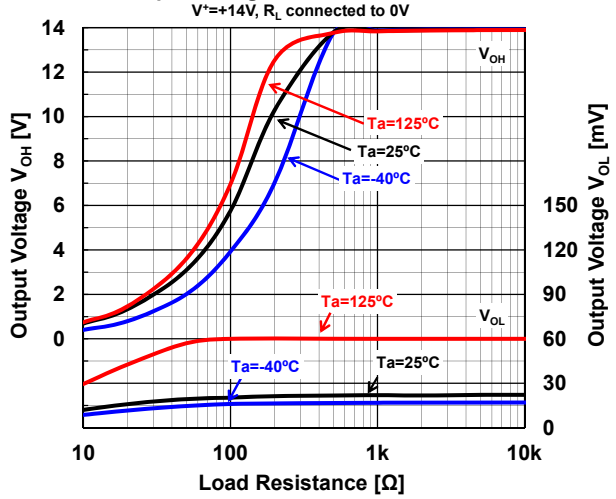


Output Sink Current vs. Temperature
V_O=V^-+0.5V

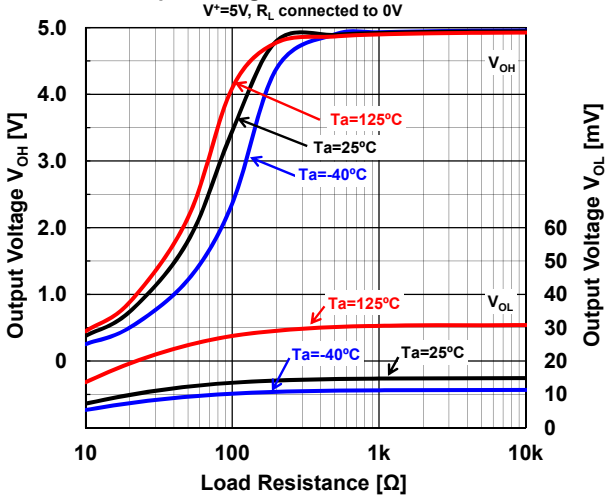


■ **TYPICAL CHARACTERISTICS** (V^-=0V, V_{CM}=V^+/2, unless otherwise specified)

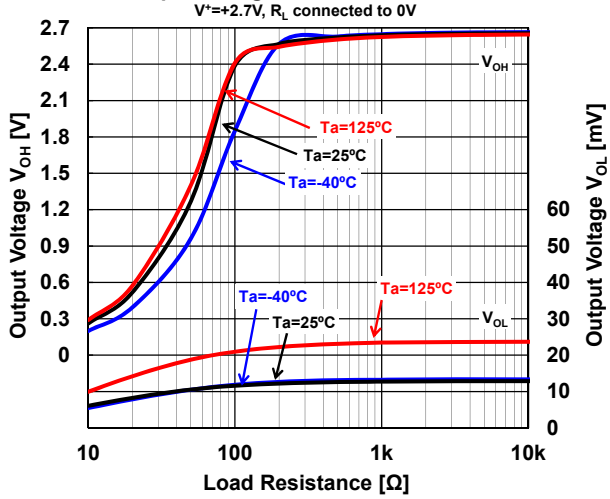
Output Voltage vs. Load Resistance
V^+=+14V, R_L connected to 0V



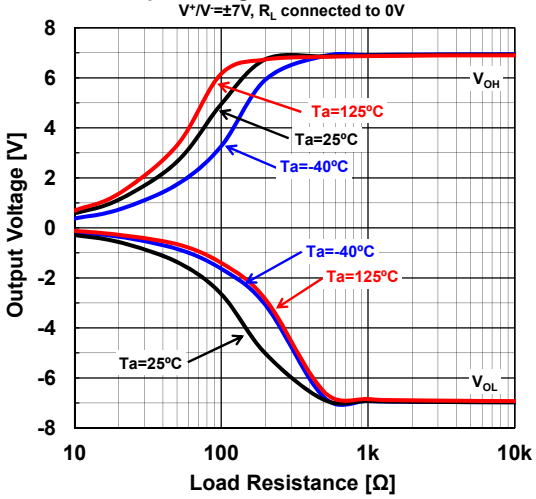
Output Voltage vs. Load Resistance
V^+=5V, R_L connected to 0V



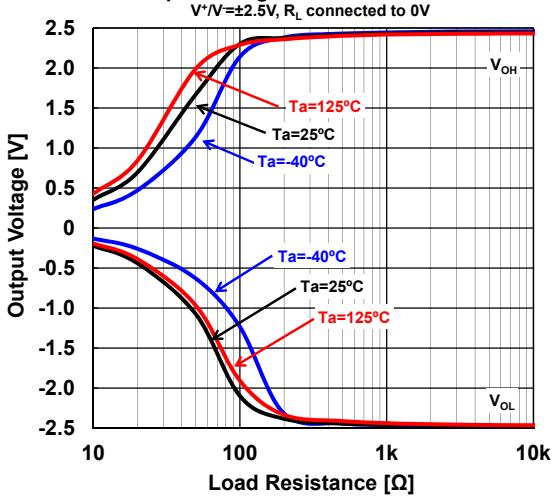
Output Voltage vs. Load Resistance
V^+=+2.7V, R_L connected to 0V



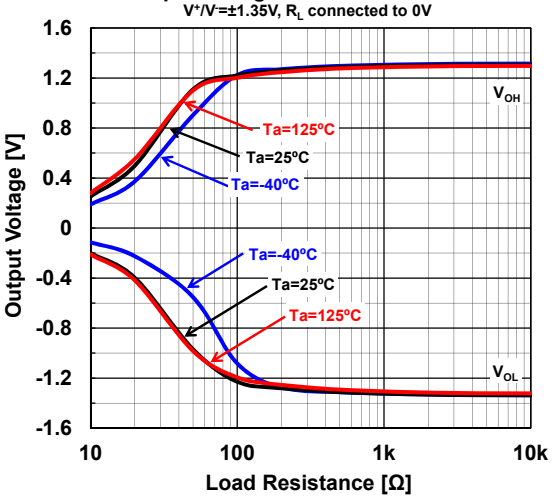
Output Voltage vs. Load Resistance
V^+/V^-=±7V, R_L connected to 0V



Output Voltage vs. Load Resistance
V^+/V^-=±2.5V, R_L connected to 0V



Output Voltage vs. Load Resistance
V^+/V^-=±1.35V, R_L connected to 0V



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