Data Sheet

MAX74841

Low Noise, Low Input Bias Current, Precision Operational Amplifier

FEATURES

- Fast settling time: 500ns to 0.1%
- Low offset voltage: 2mV maximum
- Low TCV_{OS}: 1.7µV/°C typical
- Low input bias current: 25pA typical
- Dual-supply operation: ±5V to ±15V
- Low noise: 8nV/√Hz typical at f = 1kHz
- Low distortion: 0.0005%
- No phase reversal
- Unity-gain stable

APPLICATIONS

- Instrumentation
- Multipole filters
- Precision current measurement
- Photodiode amplifiers
- Sensors
- Audio

GENERAL DESCRIPTION

The MAX74841 is a dual-junction field effect transistor (JFET) amplifier that features low offset voltage, input bias current, input voltage noise, and input current noise.

Low offsets, low noise, and low input bias current makes this amplifier especially suitable for high-impedance sensor amplification and precise current measurements using shunts. DC precision, low noise, and fast settling time combine to deliver superior accuracy in medical instruments, electronic measurement, and automated test equipment. The MAX74841 maintains its fast settling performance even with substantial capacitive loads, in contrast to many competitive amplifiers. The MAX74841 does not suffer from output phase reversal when input voltages exceed the maximum common-mode voltage range compared to many older JFET amplifiers.

Fast slew rate and strong stability with capacitive loads make the MAX74841 a perfect fit for high performance filters. Low input bias currents, low offset, and low noise enable photodiode amplifier circuits to achieve a wide dynamic range. Low noise and distortion, high output current, and excellent speed make the MAX74841 an excellent choice for audio applications.

The MAX74841 is available in **8-lead [MSOP] (RM-8)** package and operates at the extended industrial temperature range from −40°C to +125°C.

One Analog Way, Wilmington, MA 01887-2356, U.S.A.

TABLE OF CONTENTS

REVISION HISTORY

8/2026—Revision 0: Initial Version

SPECIFICATIONS

Electrical Characteristics

At V_S = ±15V, V_{CM} = 0V, T_A = 25°C, unless otherwise noted.

Table 1. Electrical Characteristics

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}			0.3	2	mV
		−40°C < T_A < +125°C		1.8		mV
Input Bias Current	I_B			25	100	pA
		−40°C < T_A < +125°C		10		nA
Input Offset Current	I_{OS}			6	75	pA
		−40°C < T_A < +125°C		0.5		nA
Input Capacitance	C_{INDM}	Differential-mode		12.5		pF
	C_{INCM}	Common-mode		11.5		pF
Input Voltage Range			−13.5		+13.0	V
Common-Mode Rejection Ratio	CMRR	V_{CM} = −12.5V to +12.5V	86	108		dB
Large-Signal Voltage Gain	A_{VO}	R_L = 2kΩ, V_{CM} = 0V, V_O = −13.5V to +13.5V	101	105		dB
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$			1.7	12	µV/°C
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	R_L = 10kΩ	+14.0	+14.2		V
Output Voltage Low	V_{OL}	R_L = 10kΩ, −40°C < T_A < +125°C		−14.9	−14.6	V
Output Voltage High	V_{OH}	R_L = 2kΩ	+13.8	+14.1		V
Output Voltage Low	V_{OL}	R_L = 2kΩ, −40°C < T_A < +125°C		−14.8	−14.5	V
Output Voltage High	V_{OH}	R_L = 600Ω	+13.5	+13.9		V
		R_L = 600Ω, −40°C < T_A < +125°C	+11.4			V
Output Voltage Low	V_{OL}	R_L = 600Ω		−14.3	−13.8	V
		R_L = 600Ω, −40°C < T_A < +125°C			−12.1	V
Output Current	I_{OUT}			±70		mA
POWER SUPPLY						
Power-Supply Rejection Ratio	PSRR	V_S = ±4.5V to ±18V	86	130		dB
Supply Current/Amplifier	I_{SY}	V_O = 0V		2.2	2.5	mA
		−40°C < T_A < +125°C		2.6		mA
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L = 2kΩ		20		V/µs
Gain Bandwidth Product	GBP			8		MHz
Settling Time	t_S	To 0.1%, 0V to 10V step, G = +1		0.5		µs
		To 0.01%, 0V to 10V step, G = +1		0.9		µs
Total Harmonic Distortion (THD) + Noise	THD + N	1kHz, G = +1, R_L = 2kΩ		0.0005		%
Phase Margin	ϕ_M			52		Degrees
NOISE PERFORMANCE						
Voltage Noise Density	e_n	f = 1kHz		8.0	10	nV/√Hz
		f = 10kHz		7.6		nV/√Hz
Peak-To-Peak Voltage Noise	e_n p-p	0.1Hz to 10Hz bandwidth		2.4	5.2	µV p-p

ABSOLUTE MAXIMUM RATINGS

Table 2. Absolute Maximum Ratings

PARAMETER	RATING
Supply Voltage	±18V
Input Voltage	$\pm V_S$
Output Short-Circuit Duration to GND	Indefinite
Temperature	
Storage Range	−65°C to +150°C
Operating Range	−40°C to +125°C
Junction Range	−65°C to +150°C
Lead (Soldering, 10sec)	300°C

Stresses at or above those listed under Absolute Maximum Ratings may cause permanent damage to the product. This is a stress rating only; functional operation of the product at these or any other conditions above those indicated in the operational section of this specification is not implied. Operation beyond the maximum operating conditions for extended periods may affect product reliability.

Thermal Resistance

Thermal performance is directly linked to printed circuit board (PCB) design and operating environment. Careful attention to PCB thermal design is required.

θ_{JA} is the natural convection junction-to-ambient thermal resistance measured in a one cubic foot sealed enclosure.

θ_{JC} is the junction-to-case thermal resistance.

Table 3. Thermal Resistance

PACKAGE TYPE	Θ_{JA}	Θ_{JC}	UNIT
8-Lead [MSOP] (RM-8)	210	45	°C/W

Electrostatic Discharge (ESD) Ratings

The following ESD information is provided for handling of ESD-sensitive devices in and ESD-protected area only.

Human body model (HBM) per ESDA/JEDEC JS-001-2011 applicable standard.

ESD Ratings for MAX74841

Table 4. MAX74841, 8-Lead [MSOP] (RM-8)

ESD MODEL	WITHSTAND THRESHOLD (V)	CLASS
HBM	2000	2

ESD Caution

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

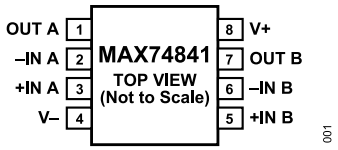

Figure 1. 8-Lead [MSOP] (RM Suffix)

Table 5. Pin Function Descriptions

PIN NUMBER	MNEMONIC	DESCRIPTION
1	OUT A	Output Channel A.
2	−IN A	Inverting Input Channel A.
3	+IN A	Noninverting Input Channel A.
4	V−	Negative Supply Voltage.
5	+IN B	Noninverting Input Channel B.
6	−IN B	Inverting Input Channel B.
7	OUT B	Output Channel B.
8	V+	Positive Supply Voltage.

TYPICAL PERFORMANCE CHARACTERISTICS

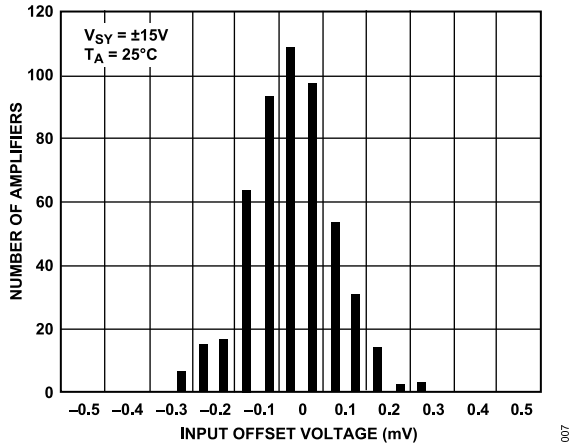

Figure 2. Input Offset Voltage Distribution

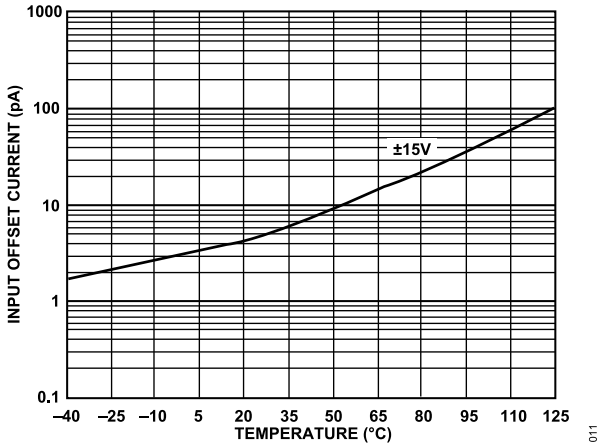

Figure 5. Input Offset Current vs. Temperature

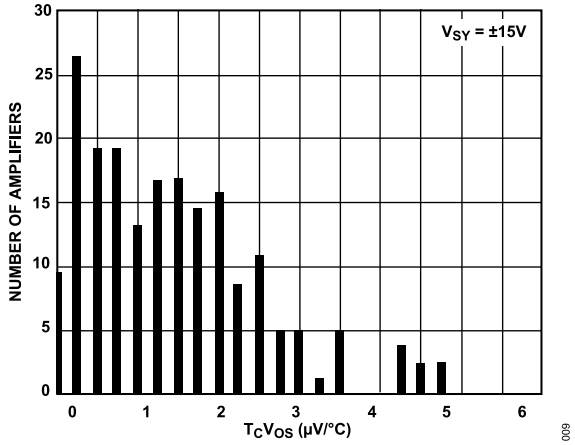

Figure 3. TCV_{OS} Distribution

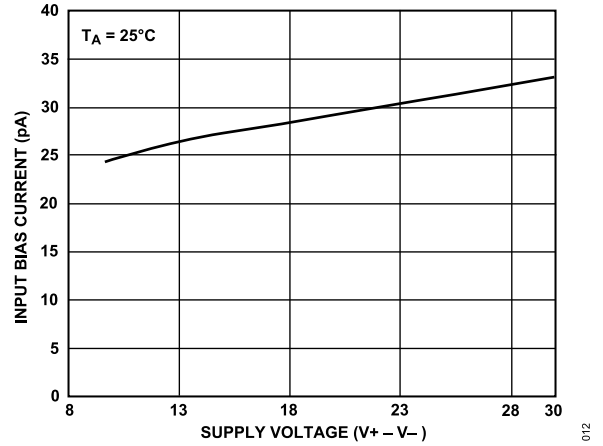

Figure 6. Input Bias Current vs. Supply Voltage

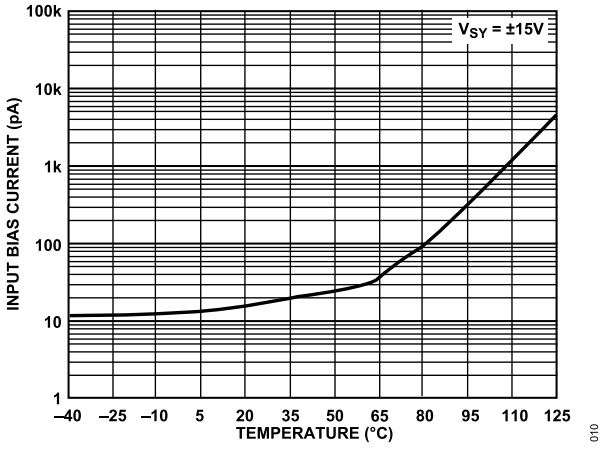

Figure 4. Input Bias Current vs. Temperature

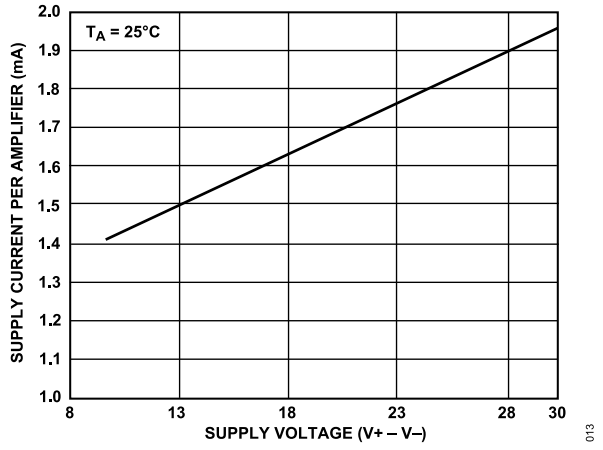

Figure 7. Supply Current per Amplifier vs. Supply Voltage

TYPICAL PERFORMANCE CHARACTERISTICS

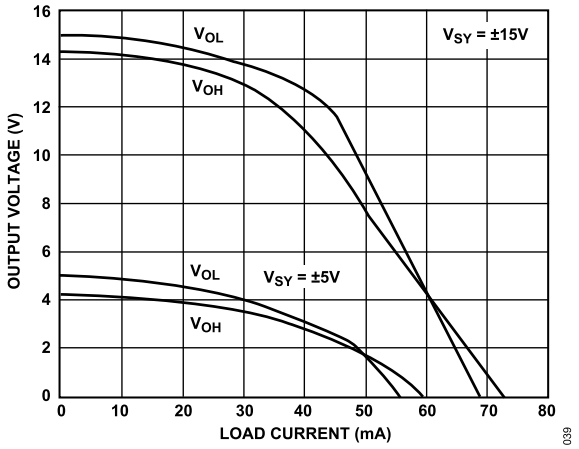

Figure 8. Output Voltage vs. Load Current

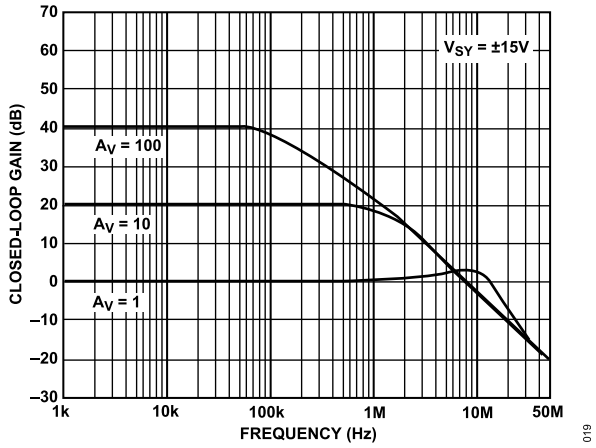

Figure 11. Closed-Loop Gain vs. Frequency

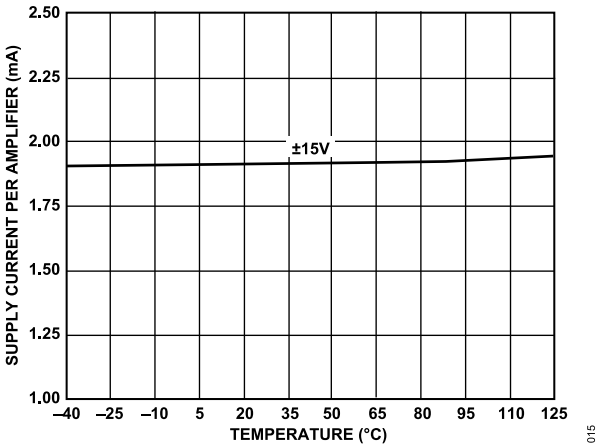

Figure 9. Supply Current per Amplifier vs. Temperature

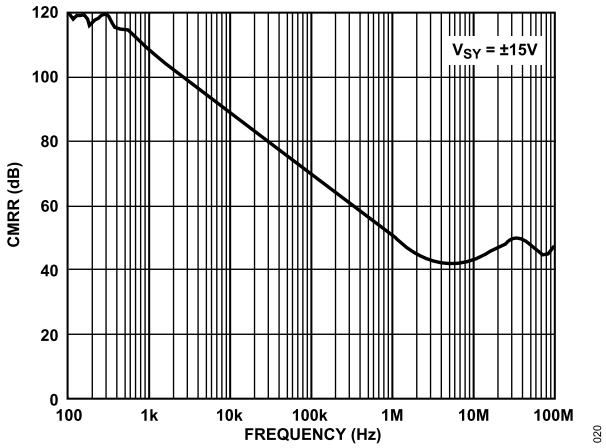

Figure 12. CMRR vs. Frequency

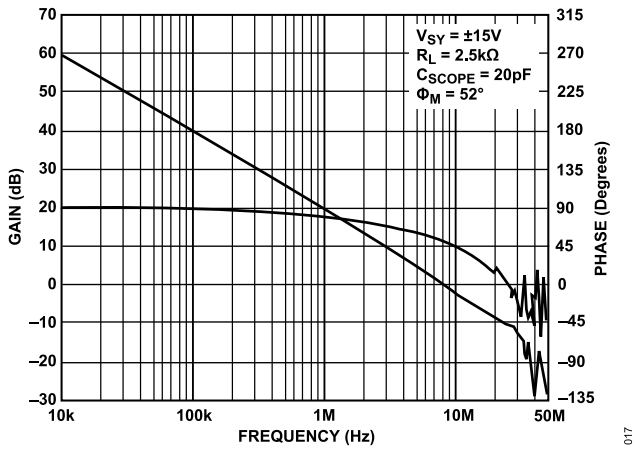

Figure 10. Open-Loop Gain and Phase vs. Frequency

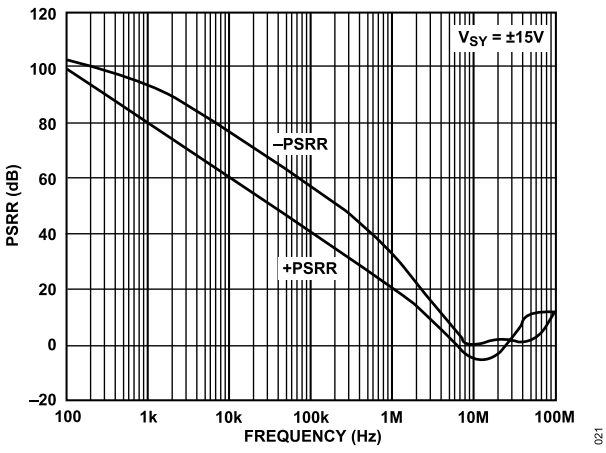

Figure 13. PSRR vs. Frequency

TYPICAL PERFORMANCE CHARACTERISTICS

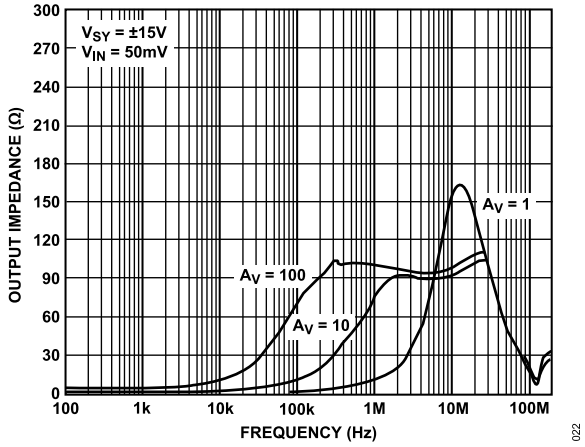

Figure 14. Output Impedance vs. Frequency

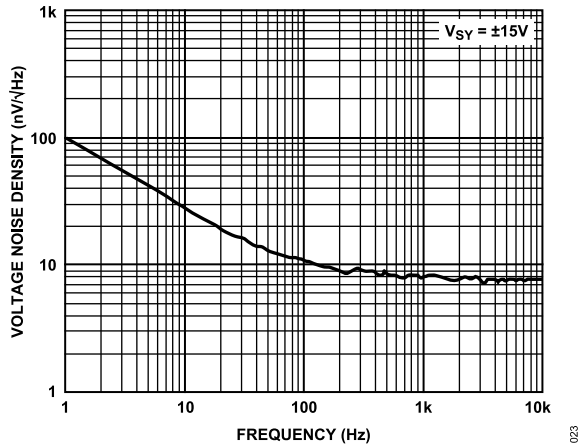

Figure 15. Voltage Noise Density vs. Frequency

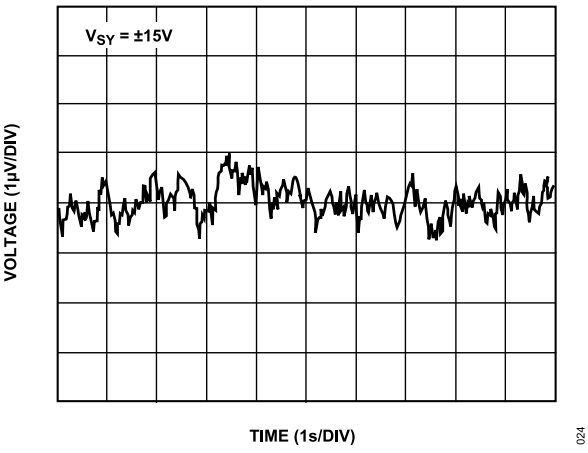

Figure 16. 0.1Hz to 10Hz Input Voltage Noise

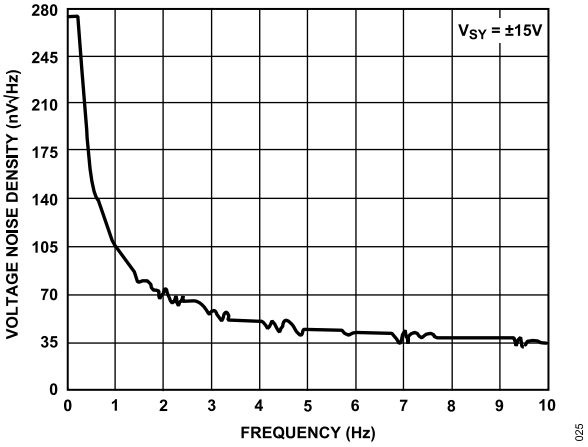

Figure 17. Voltage Noise Density vs. Frequency

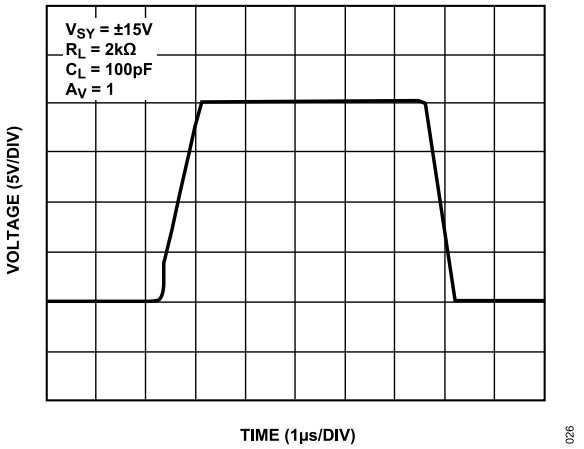

Figure 18. Large-Signal Transient Response

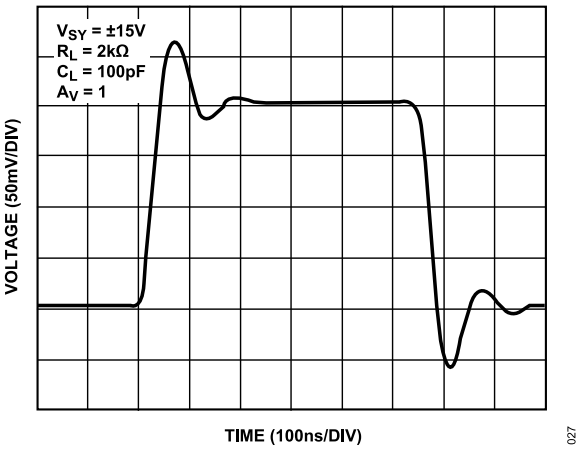

Figure 19. Small-Signal Transient Response

TYPICAL PERFORMANCE CHARACTERISTICS

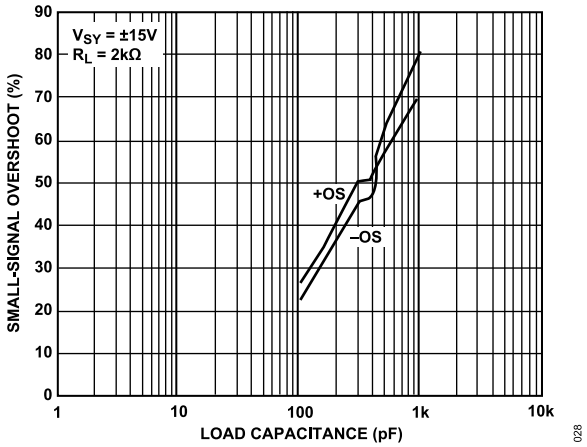

Figure 20. Small-Signal Overshoot vs. Load Capacitance

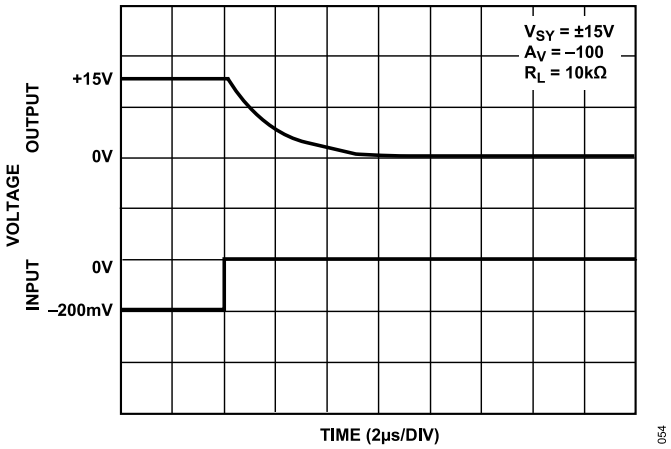

Figure 22. Negative Overload Recovery

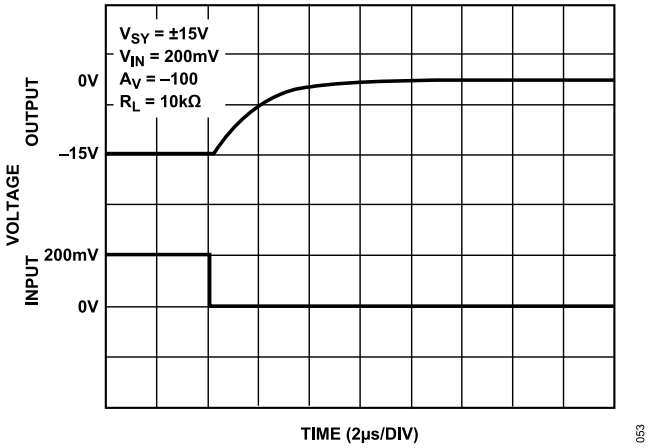

Figure 21. Positive Overload Recovery

THEORY OF OPERATION

The MAX74841 is a dual, precision JFET-input operational amplifier that integrates low input bias current, low broadband voltage noise, high DC open-loop gain, and fast dynamic performance within a single, unity-gain stable device.

The MAX74841 delivers high DC accuracy and rapid transient response for signal-conditioning applications, which include photodiode transimpedance amplifiers, high-impedance sensor front ends, precision instrumentation, active filters, and low-distortion audio stages. Key performance highlights include 25pA typical input bias current, 8nV/√Hz voltage noise density, 105dB open-loop gain, a 20V/µs slew rate, and a 500ns settling time, which allow the device to process both slowly varying DC signals and fast analog waveforms.

APPLICATIONS INFORMATION

Input Overvoltage Protection

The MAX74841 includes internal protective circuitry that allows either input terminal to withstand voltages up to 0.7V beyond the supplies without sustaining damage. Use a series resistor to limit the input current for higher input voltages. Use the following formula to determine the resistor value:

$$\frac{V_{IN} - V_S}{R_S} \leq 5mA \quad (1)$$

With a low offset current of typically 0.5nA up to 125°C, use a higher resistor values in series with the inputs. A 5kΩ resistor protects the inputs from voltages as high as 25V beyond the supplies and adds less than 10µV to the offset.

Capacitive Load Drive

The MAX74841 remains unconditionally stable at all gains in both inverting and noninverting configurations. Each device can drive a capacitive load of up to 1000pF in the worst-case unity-gain configuration without oscillating.

However, as with most amplifiers, driving larger capacitive loads in a unity-gain configuration can cause excessive overshoot and ringing, or even oscillation. A simple snubber network significantly reduces the amount of overshoot and ringing, see **Figure 23**. The advantage of this configuration is that the output swing of the amplifier is maintained, because R_S is outside the feedback loop.

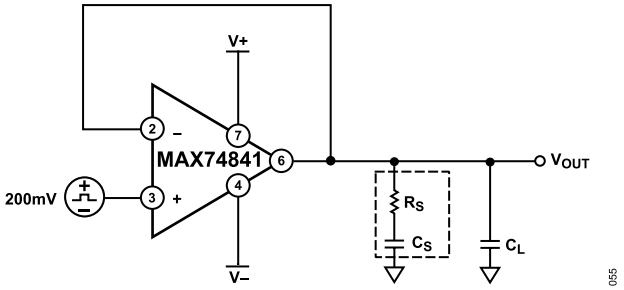

Figure 23. Snubber Network Configuration

Figure 24 shows a scope plot of the output of the MAX74841 in response to a 400mV pulse. The circuit uses a positive unity-gain configuration (worst-case condition) and drives a 500pF load.

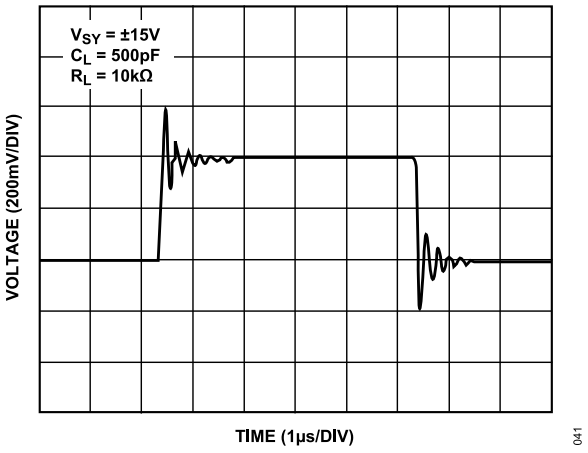

Figure 24. Capacitive Load Drive Without Snubber

Using the snubber circuit reduces the overshoot from 55% to less than 3% with the same load capacitance. **Figure 25** shows that using the snubber circuit virtually eliminates ringing.

APPLICATIONS INFORMATION

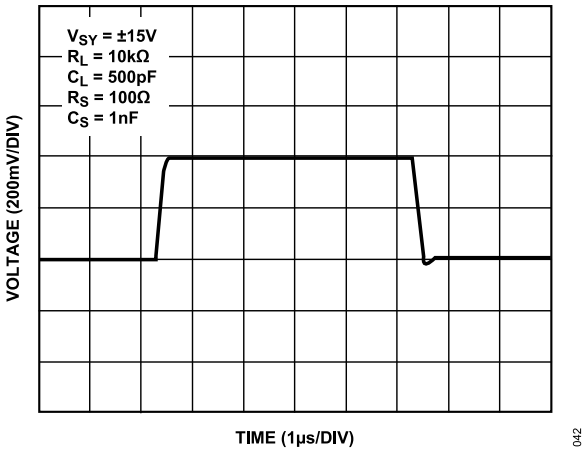

Figure 25. Capacitive Load with Snubber Network

The optimum values of R_S and C_S are determined experimentally based on the load capacitance and input stray capacitance. **Table 6** provides several values that can be used as starting points.

Table 6. Optimum Values for Capacitive Loads

C_{LOAD}	R_S (Ω)	C_S
500pF	100	1nF
2nF	70	100pF
5nF	60	300pF

OUTLINE DIMENSIONS

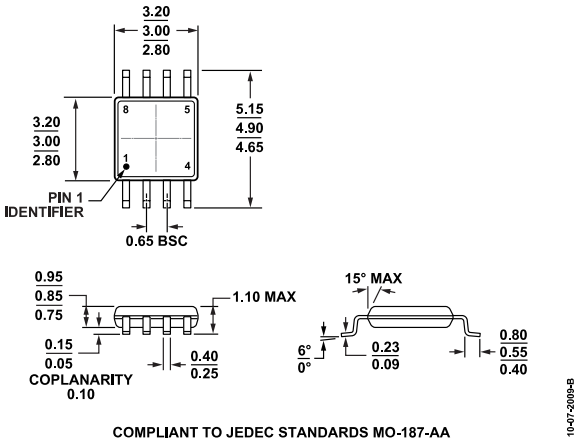

Figure 26. 8-Lead Mini Small Outline Package [MSOP]
(RM-8)
Dimensions shown in millimeters

Updated: August 06, 2026

Ordering Guide

MODEL[1]	TEMPERATURE RANGE	PACKAGE DESCRIPTION	PACKING QUANTITY	PACKAGE OPTION	MARKING CODE
MAX74841ARMZ	−40°C to +125°C	8-Lead [MSOP]	Tube, 50	RM-8	A6X
MAX74841ARMZ-R7	−40°C to +125°C	8-Lead [MSOP]	Reel7, 1000	RM-8	A6X
MAX74841ARMZ-RL	−40°C to +125°C	8-Lead [MSOP]	Reel, 3000	RM-8	A6X

[1] Z = RoHS Compliant Part.