Data Sheet

MAX74801

30V, Low Noise, Precision Operational Amplifier

FEATURES

- Offset voltage: 100µV maximum
- Offset voltage drift: 1.5µV/°C maximum
- MSL1 rated
- Low-input bias current: 1.5nA maximum
- Low-voltage noise density: 6.9nV/√Hz typical at f = 1kHz
- CMRR, PSRR, and A_V > 120dB minimum
- Low supply current: 400µA per amplifier typical
- Gain bandwidth product: 3.6MHz
- Dual-supply operation: ±2.5V to ±15V
- Unity gain stable
- No phase reversal
- Long-term offset voltage drift (10,000hours): 0.5µV typical

APPLICATIONS

- Process control front-end amplifiers
- Optical network control circuits
- Instrumentation
- Precision sensors and controls
- Precision filters

GENERAL DESCRIPTION

The MAX74801 amplifier features low offset voltage and drift, and low input bias current, noise, and power consumption. Outputs are stable with capacitive loads of more than 1000pF with no external compensation.

Applications for this amplifier include sensor signal conditioning (such as thermocouples, resistance temperature detectors (RTDs), and strain gages), process control front-end amplifiers, and precision diode power measurement in optical and wireless transmission systems. The MAX74801 is useful in line powered and portable instrumentation, precision filters, and voltage or current measurement and level setting.

Compared to other amplifiers, the MAX74801 has an MSL1 rating that meets the most stringent assembly process requirements. The MAX74801 is available in a dual **8-lead [MSOP] (RM-8)** and operates over the extended industrial temperature range from −40°C to +125°C for the most demanding operating environments.

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

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REVISION HISTORY

7/2026—Revision 0: Initial Version

SPECIFICATIONS

ELECTRICAL CHARACTERISTICS, ±15V

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

Table 1. Electrical Characteristics, ±15V

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}			50	100	µV
		−40°C < T_A < +125°C		220		µV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	−40°C < T_A < +125°C		0.5	1.5	µV/°C
Input Bias Current	I_B		−1.5	−0.4	+1.5	nA
		−40°C < T_A < +125°C		±2		nA
Input Offset Current	I_{OS}		−0.5	+0.1	+0.5	nA
		−40°C < T_A < +125°C		±1		nA
Input Voltage Range			−13.8		+13	V
Common-Mode Rejection Ratio	CMRR	V_{CM} = −13.8V to +13V	130	145		dB
		−40°C < T_A < +125°C		130		dB
Large Signal Voltage Gain	Av	R_L = 2kΩ, V_O = −13.0V to +13.0V	125	130		dB
		−40°C < T_A < +125°C		120		dB
Input Capacitance	C_{INDM}	Differential mode		3		pF
	C_{INCM}	Common mode		5		pF
Input Resistance	R_{IN}	Common mode		70		GΩ
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	I_L = 1mA	13.5			V
		−40°C < T_A < +125°C		13.2		V
Output Voltage Low	V_{OL}	I_L = 1mA			−13.5	V
		−40°C < T_A < +125°C		−13.2		V
Output Current	I_{OUT}	$V_{DROPOUT}$ < 1.2V		±10		mA
Short-Circuit Current	I_{SC}	T_A = 25°C		22		mA
Closed-Loop Output Impedance	Z_{OUT}	f = 1kHz, A_V = +1		0.05		Ω
POWER SUPPLY						
Power-Supply Rejection Ratio	PSRR	V_S = ±2.5V to ±18V	123	128		dB
		−40°C < T_A < +125°C		120		dB
Supply Current Per Amplifier	I_{SY}	V_O = 0V		400	500	µA
		−40°C < T_A < +125°C		650		µA
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L = 2kΩ		1.2		V/µs
Settling Time To 0.01%	t_s	V_{IN} = 10V p-p, R_L = 2kΩ, A_V = −1		16		µs
Settling Time To 0.1%	t_s	V_{IN} = 10V p-p, R_L = 2kΩ, A_V = −1		10		µs
Gain Bandwidth Product	GBP	V_{IN} = 10mV p-p, R_L = 2kΩ, A_V = +100		3.6		MHz
Unity-Gain Crossover	UGC	V_{IN} = 10mV p-p, R_L = 2kΩ, A_V = +1		3.9		MHz
−3dB Closed-Loop Bandwidth	−3dB	V_{IN} = 10mV p-p, R_L = 2kΩ, A_V = +1		5.5		MHz
Phase Margin	ΦM	V_{IN} = 10mV p-p, R_L = 2kΩ, A_V = +1		58		Degrees
Total Harmonic Distortion Plus Noise	THD + N	V_{IN} = 1V RMS, R_L = 2kΩ, A_V = +1, f = 1kHz		0.004		%

SPECIFICATIONS

Table 1. Electrical Characteristics, ±15V (Continued)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
NOISE PERFORMANCE						
Voltage Noise	e_n p-p	0.1Hz to 10Hz		0.25		µV p-p
Voltage Noise Density	e_n	f = 1Hz		13		nV/√Hz
		f = 100Hz		7		nV/√Hz
		f = 1000Hz		6.9		nV/√Hz
Current Noise Density	i_n	f = 1kHz		0.2		pA/√Hz
MULTIPLE AMPLIFIERS CHANNEL SEPARATION						
Channel Separation	C_S	f = 1kHz, R_L = 10kc		−125		dB

ABSOLUTE MAXIMUM RATINGS

Table 2. Absolute Maximum Ratings

PARAMETER	RATING
Supply Voltage	36V
Input Voltage	$\pm V_{SY}$
Input Current[1]	±10mA
Differential Input Voltage	$\pm V_{SY}$
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
Maximum Reflow (MSL1 Rating)[2]	260°C
Lead, Soldering (10sec)	300°C

[1] The input pins have clamp diodes to the power supply pins and to each other. Limit the input current to 10mA or less whenever input signals exceed the power supply rail by 0.3V.

[2] IPC/JEDEC J-STD-020 applicable standard.

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)	190	44	°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.

Field-induced charged device model (FICDM) per JESD22-C101 (ESD FICDM standard of JEDEC) applicable standard.

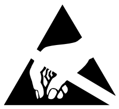
ESD Ratings for MAX74801

Table 4. MAX74801, 8-Lead [MSOP] (RM-8)

ESD MODEL	WITHSTAND THRESHOLD (V)	CLASS
HBM	6k	3A
FICDM	1.25k	C3

ABSOLUTE MAXIMUM RATINGS

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

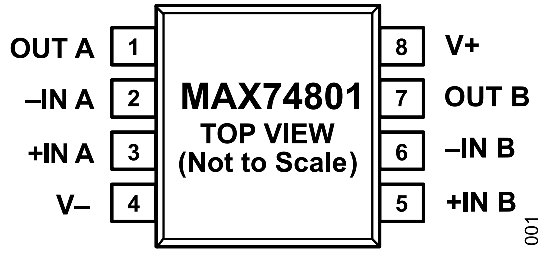


Figure 1. 8-Lead [MSOP] (RM Suffix)

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

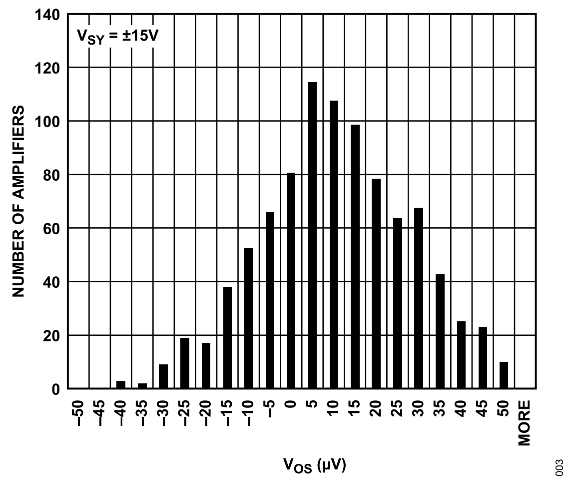


Figure 2. Offset Voltage (V_{OS}) Distribution

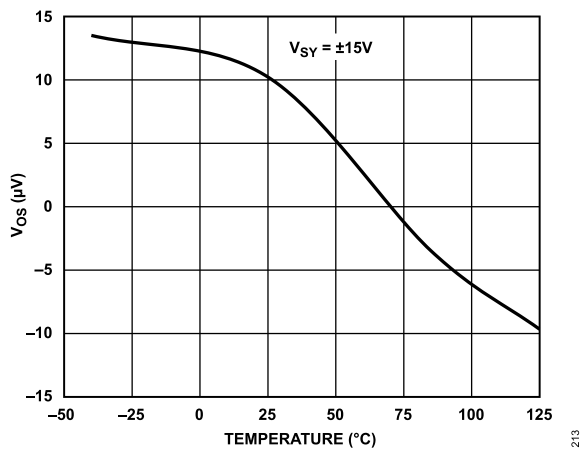


Figure 3. Offset Voltage (V_{OS}) vs. Temperature

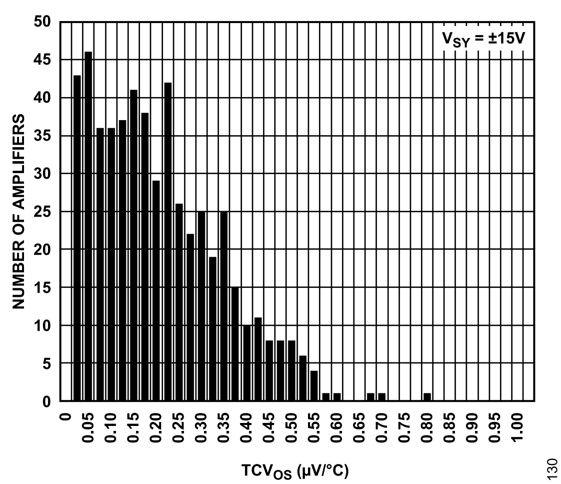


Figure 4. TCV_{OS} Distribution

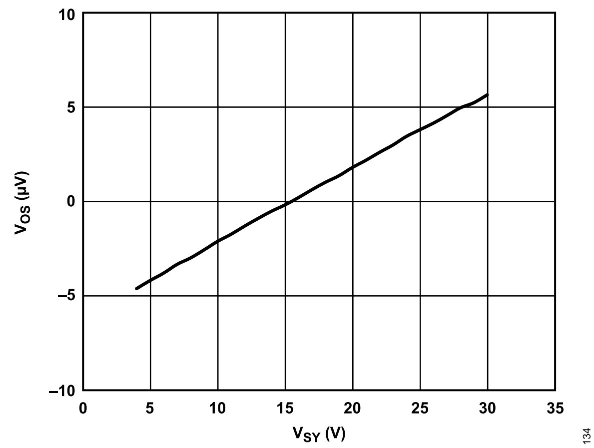


Figure 5. Offset Voltage (V_{OS}) vs. Power Supply Voltage (V_{SY})

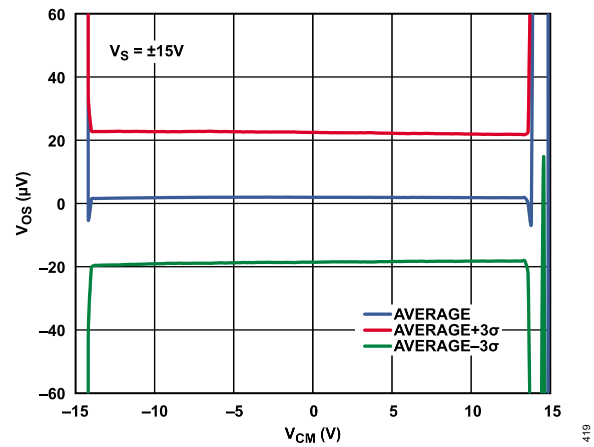


Figure 6. Offset Voltage (V_{OS}) vs. Common-Mode Voltage (V_{CM})

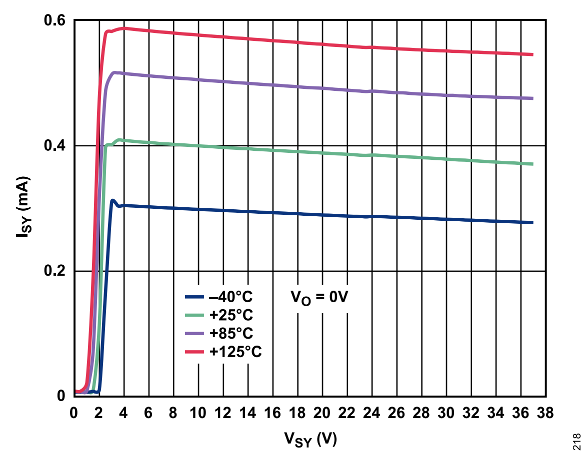


Figure 7. Supply Current per Amplifier (I_{SY}) vs. Power Supply Voltage (V_{SY})

TYPICAL PERFORMANCE CHARACTERISTICS

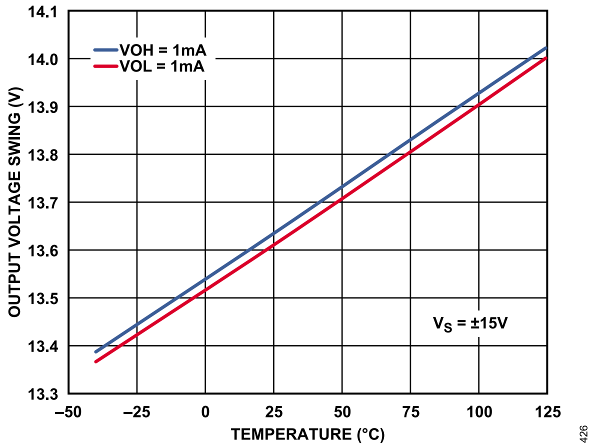


Figure 8. Output Voltage Swing vs. Temperature

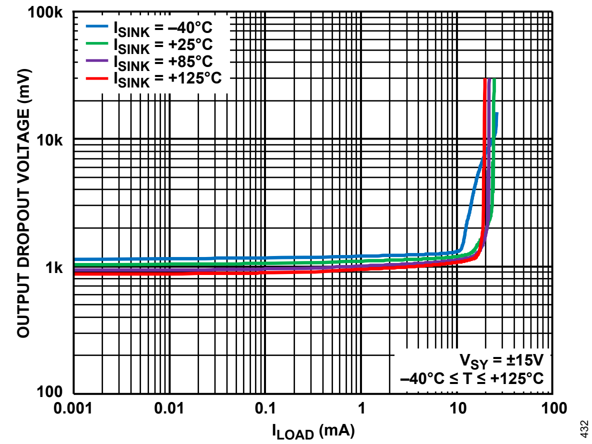


Figure 11. Output Dropout Voltage vs. I_{LOAD}, Sink Current

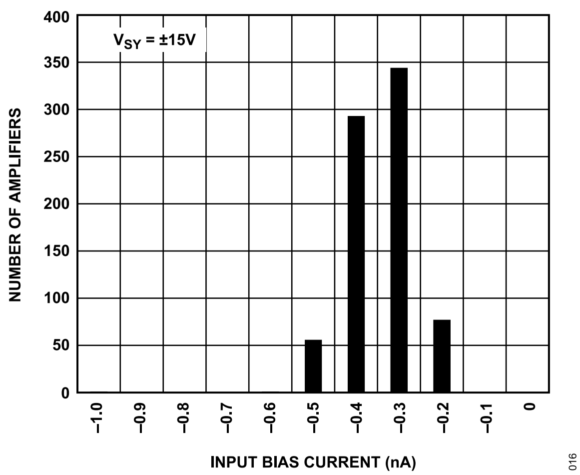


Figure 9. Input Bias Current Distribution

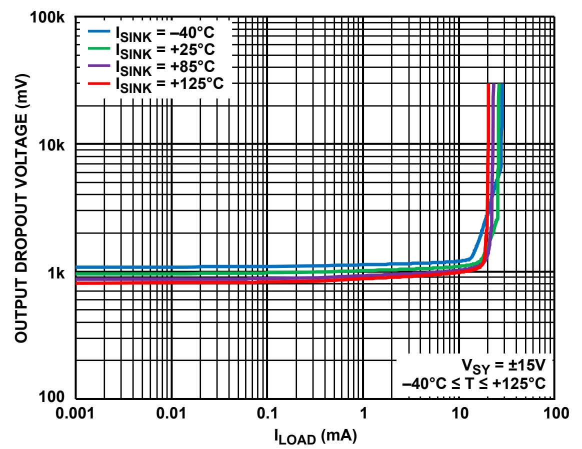


Figure 12. Output Dropout Voltage vs. I_{LOAD}, Source Current

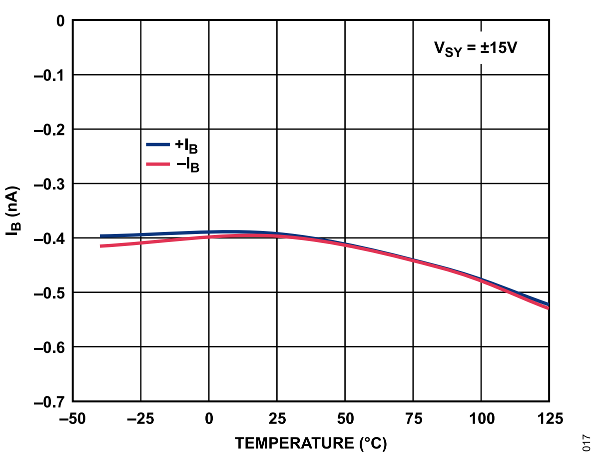


Figure 10. Input Bias Current (I_B) vs. Temperature

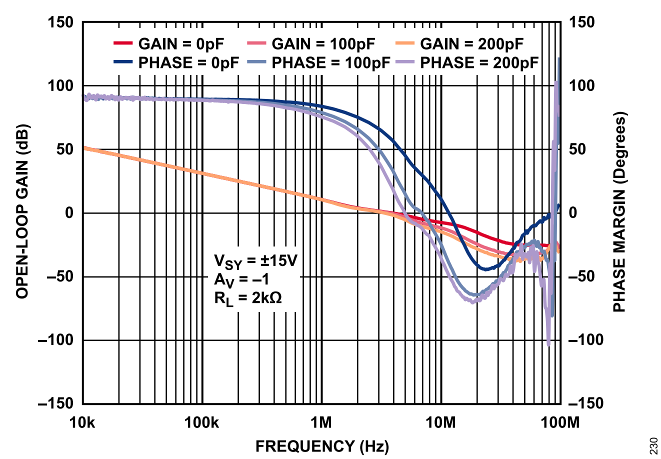


Figure 13. Open-Loop Gain and Phase Margin vs. Frequency

TYPICAL PERFORMANCE CHARACTERISTICS

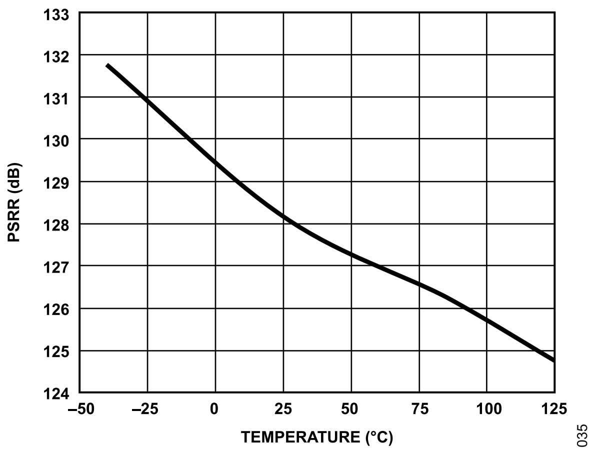


Figure 14. PSRR vs. Temperature

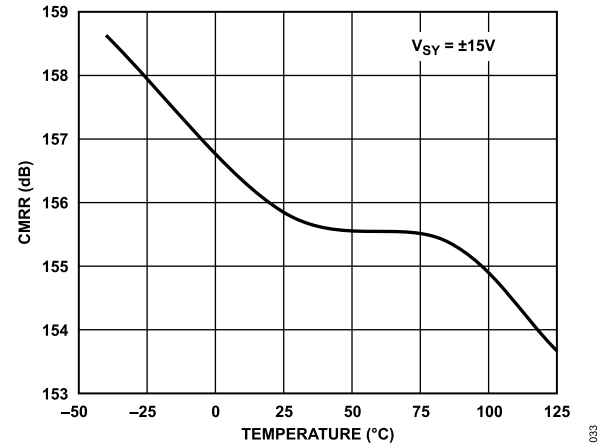


Figure 17. CMRR vs. Temperature

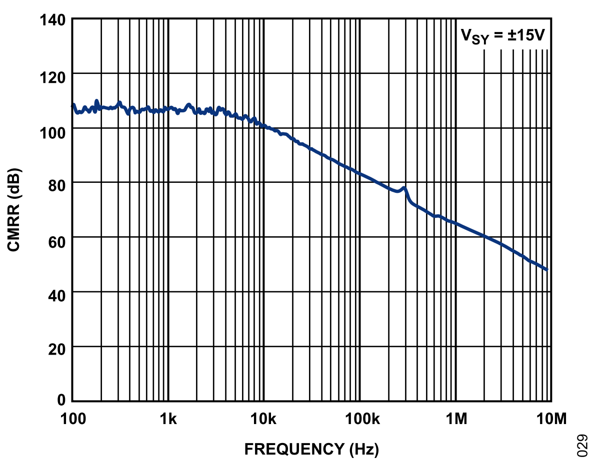


Figure 15. CMRR vs. Frequency

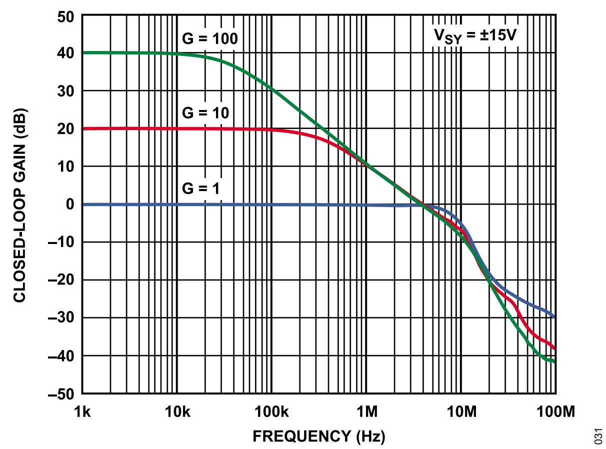


Figure 18. Closed-Loop Gain vs. Frequency

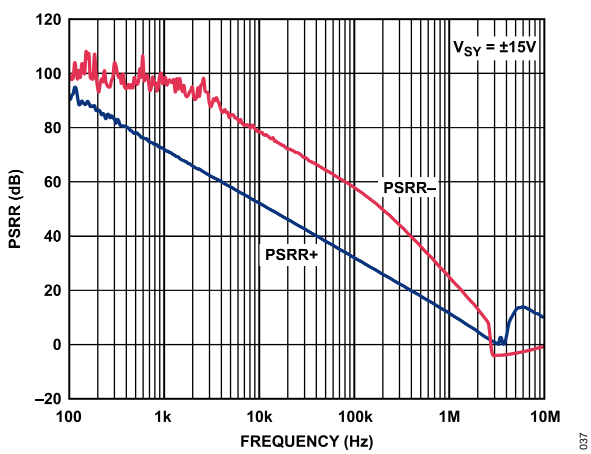


Figure 16. PSRR vs. Frequency

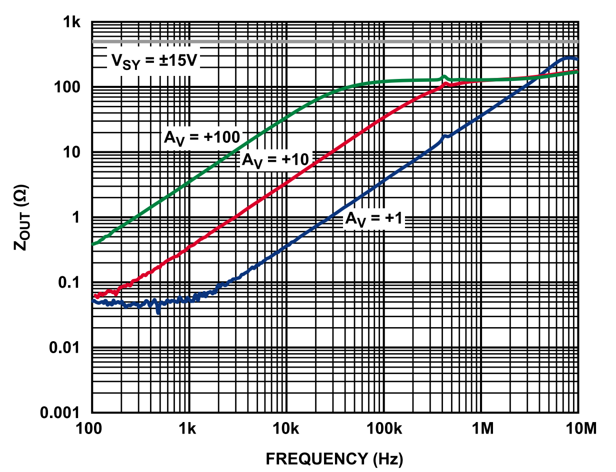


Figure 19. Output Impedance (Z_{OUT}) vs. Frequency

TYPICAL PERFORMANCE CHARACTERISTICS

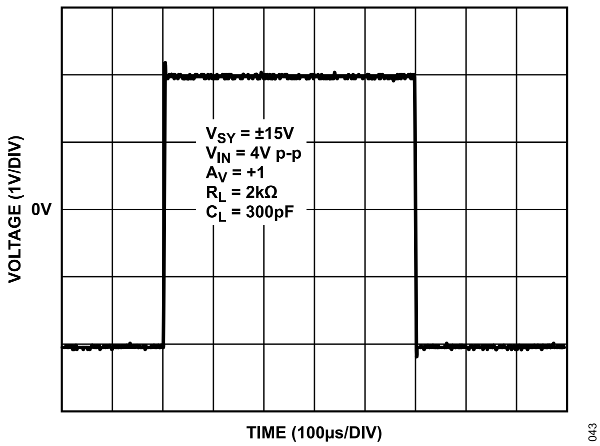


Figure 20. Large Signal Transient Response

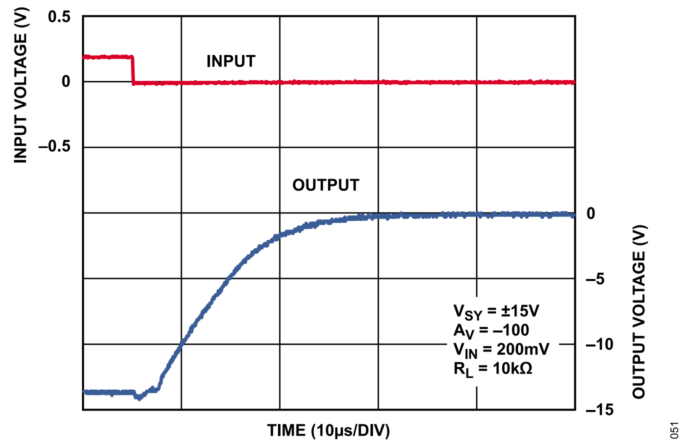


Figure 23. Negative Overload Recovery

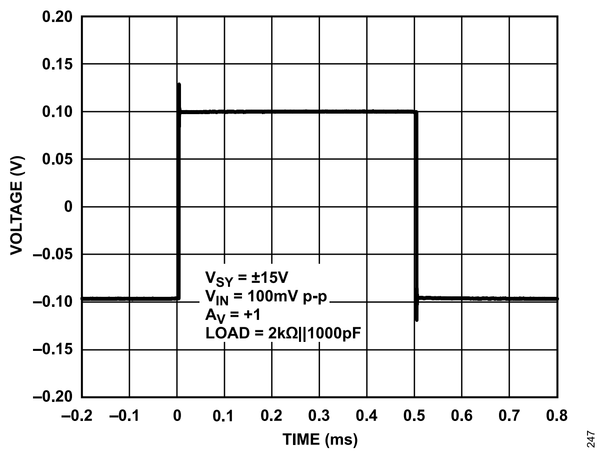


Figure 21. Small Signal Transient Response

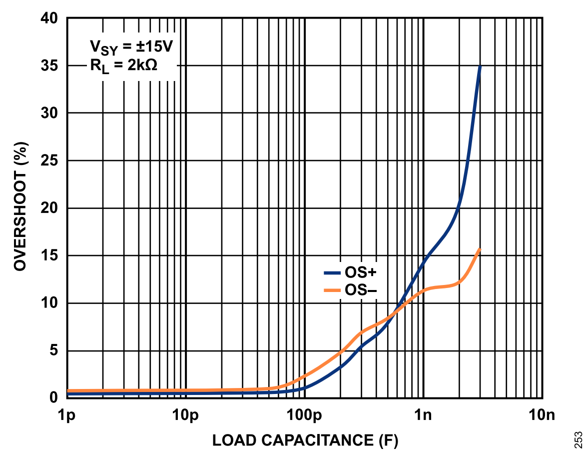


Figure 24. Small Signal Overshoot vs. Load Capacitance

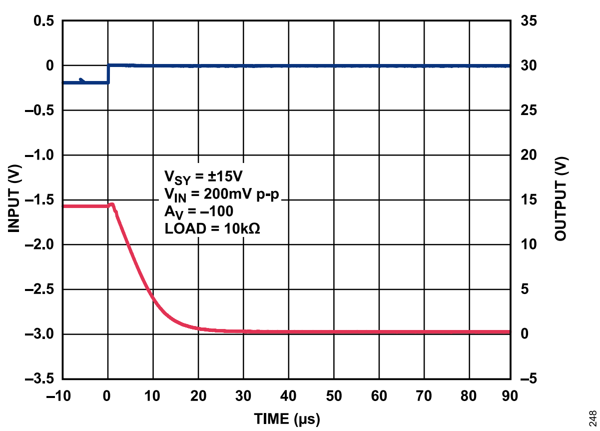


Figure 22. Positive Overload Recovery

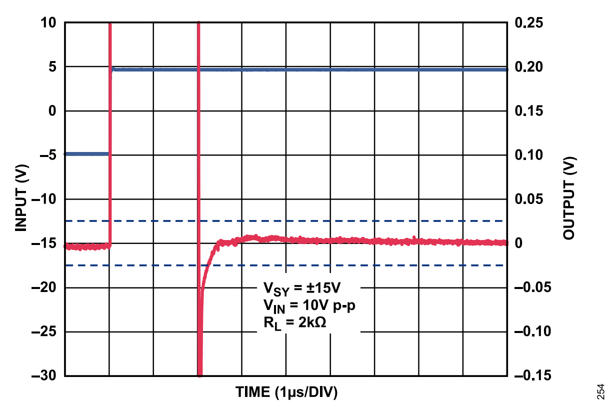


Figure 25. Positive 0.1% Settling Time

TYPICAL PERFORMANCE CHARACTERISTICS

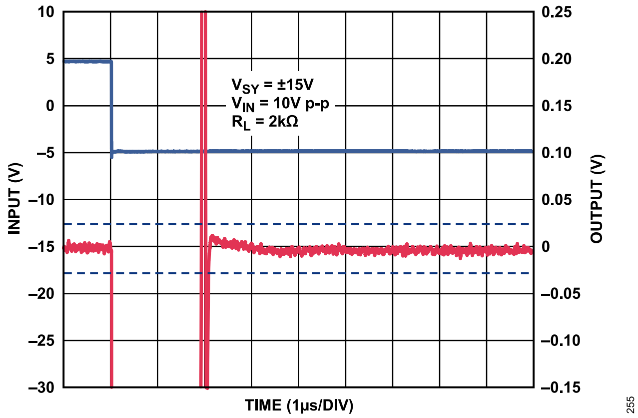


Figure 26. Negative 0.1% Settling Time

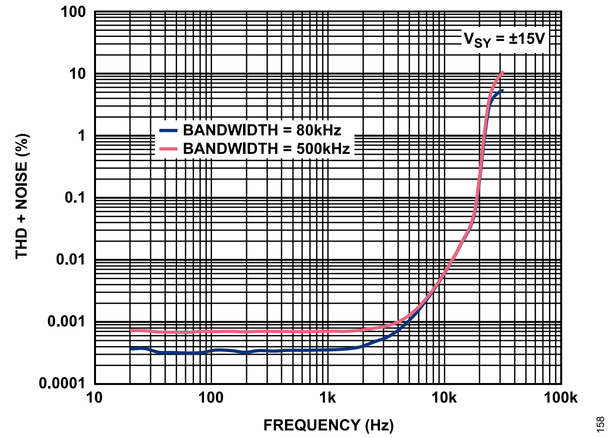


Figure 29. THD + Noise vs. Frequency

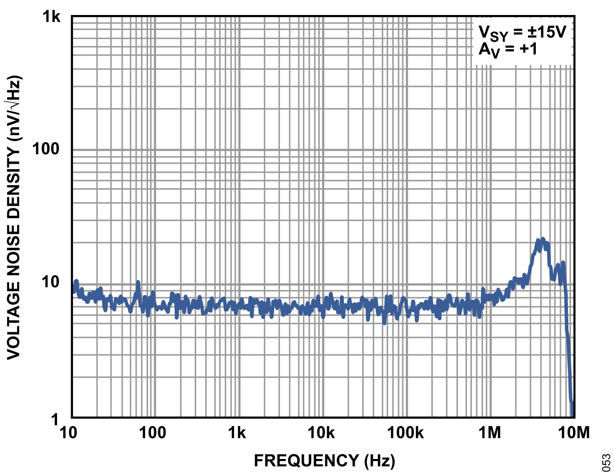


Figure 27. Voltage Noise Density vs. Frequency

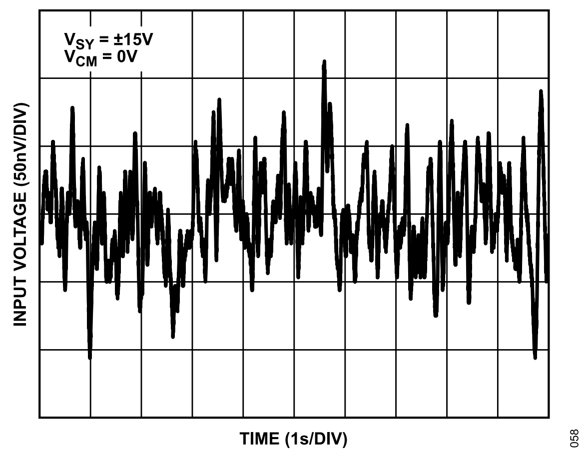


Figure 30. 0.1Hz to 10Hz Noise

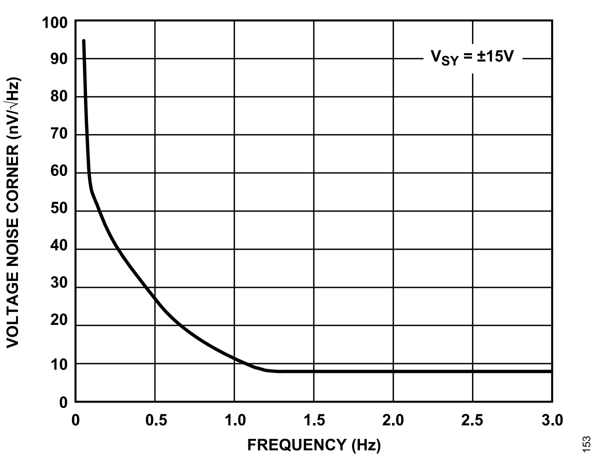


Figure 28. Voltage Noise Corner vs. Frequency

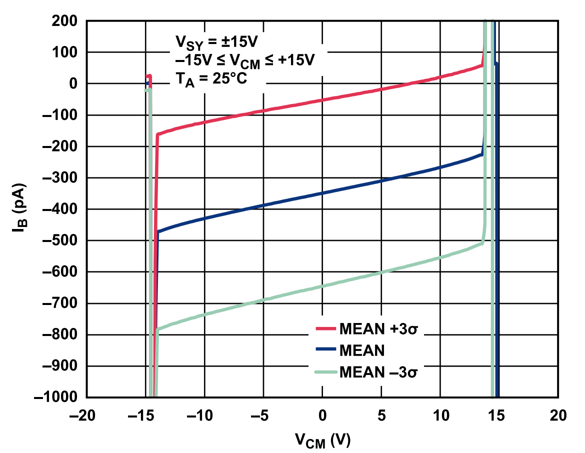


Figure 31. Input Bias Current (I_B) vs. Common-Mode Voltage (V_{CM})

TYPICAL PERFORMANCE CHARACTERISTICS

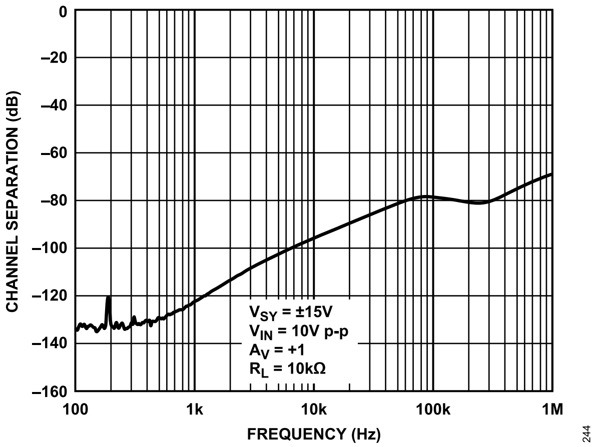


Figure 32. Channel Separation

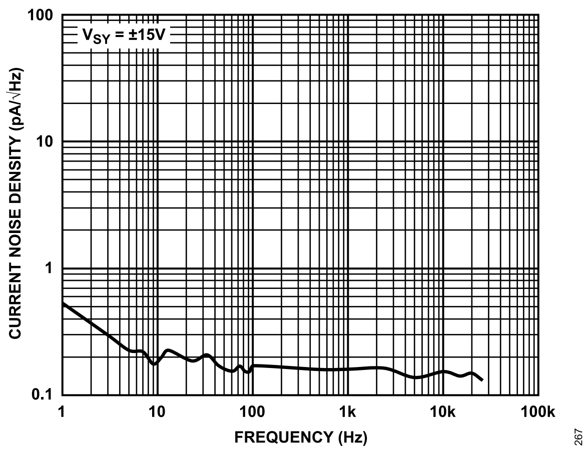


Figure 33. Current Noise Density

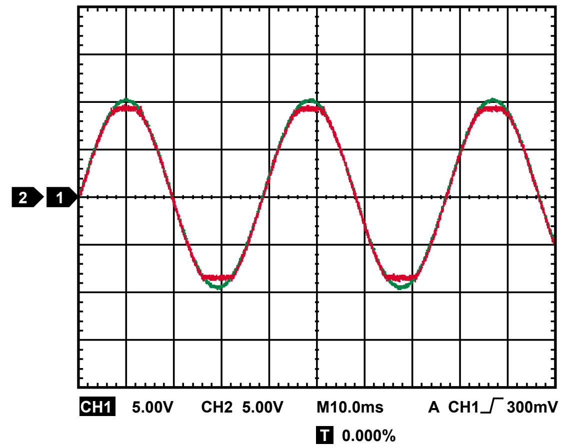


Figure 34. No Phase Reversal

THEORY OF OPERATION

The MAX74801 is a high precision, low-noise operational amplifier with a combination of extremely low offset voltage and very low input-bias currents. Compared to junction field effect transistor (JFET) amplifiers, low bias and offset currents remain relatively insensitive to ambient temperatures, even up to 125°C.

The MAX74801 has an operating temperature range of −40°C to +125°C with an MSL1 rating, which is as wide as any similar device in a plastic surface-mount package. This MSL1 rating is increasingly important as printed circuit board (PCB) and overall system sizes continue to shrink, which causes internal system temperatures to rise.

The design protects the inputs internally from overvoltage conditions referenced to either supply rail. As with any high-performance amplifier, designers can achieve maximum performance by following appropriate circuit and PCB guidelines.

APPLICATIONS INFORMATION

PROPER BOARD LAYOUT

The MAX74801 is a high precision device. Engineers must design the board layout carefully to ensure optimum PCB-level performance.

To avoid leakage currents, maintain a clean and moisture free board surface. Surface coating prevents moisture accumulation and reduces parasitic resistance on the board.

Keeping supply traces short and properly bypassing the power supplies minimizes the power supply disturbances caused by the output current variation, such as when driving an AC signal into a heavy load. Connect bypass capacitors as closely as possible to the device supply pins. Stray capacitances are a concern at the outputs and the inputs of the amplifier. It is recommended to keep the signal traces at least 5mm from supply lines to minimize coupling.

A variation in temperature across the PCB can cause a mismatch in the Seebeck voltages at solder joints and other points where dissimilar metals are in contact, resulting in thermal voltage errors. To minimize these thermocouple effects, align the resistors so that heat sources warm both ends equally. Ensure, where possible, that input signal paths contain matching numbers and types of components, to match the number and type of thermocouple junctions. For example, use dummy components such as zero value resistors to match real resistors in the opposite input path. Place matching components close together and align the components identically. Ensure that leads are of equal length so that thermal conduction is in equilibrium. Keep heat sources on the PCB as far away from amplifier input circuitry as is practical.

The use of a ground plane is highly recommended. A ground plane reduces electromagnetic interference (EMI) noise and maintains a constant temperature across the circuit board.

OUTLINE DIMENSIONS

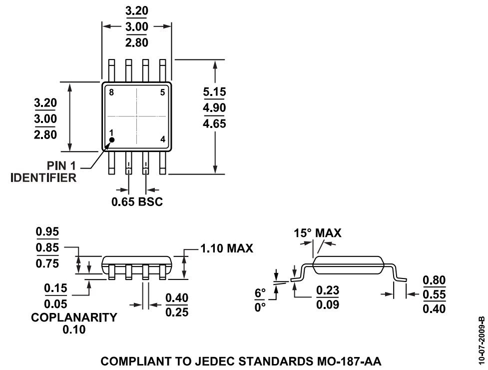


Figure 35. 8-Lead Mini Small Outline Package [MSOP]
(RM-8)
Dimensions shown in millimeters

Updated: July 13, 2026

ORDERING GUIDE

MODEL[1]	TEMPERATURE RANGE	PACKAGE DESCRIPTION	PACKING QUANTITY	PACKAGE OPTION	MARKING CODE
MAX74801ARMZ	−40°C to +125°C	8-Lead [MSOP]	Tube, 50	RM-8	A6S
MAX74801ARMZ-R7	−40°C to +125°C	8-Lead [MSOP]	Reel7, 1000	RM-8	A6S
MAX74801ARMZ-RL	−40°C to +125°C	8-Lead [MSOP]	Reel, 3000	RM-8	A6S

[1] Z = RoHS Compliant Part.