Dual and Quad Rail-to-Rail Output, Picoamp Input Precision Op Amps

FEATURES

- **Offset Voltage: 50µV Maximum (LT1881A)**
- **Input Bias Current: 200pA Maximum (LT1881A)**
- **Offset Voltage Drift: 0.8µV/°C Maximum**
- **Rail-to-Rail Output Swing**
- **Supply Range: 2.7V to 36V**
- Operates with Single or Split Supplies
- Open-Loop Voltage Gain: 1 Million Minimum
- 1mA Maximum Supply Current Per Amplifier
- Stable at $A_V = 1$, $C_L = 1000pF$
- Standard Pinouts

APPLICATIONS

- Thermocouple Amplifiers
- Bridge Transducer Conditioners
- Instrumentation Amplifiers
- Battery-Powered Systems
- Photo Current Amplifiers

DESCRIPTION

The LT®1881 and LT1882 op amps bring high accuracy input performance to amplifiers with rail-to-rail output swing. Input bias currents and capacitive load driving capabilities are superior to the similar LT1884 and LT1885 amplifiers, at the cost of a slight loss in speed. Input offset voltage is trimmed to less than 50µV and the low drift maintains this accuracy over the operating temperature range. Input bias currents are an ultralow 200pA maximum.

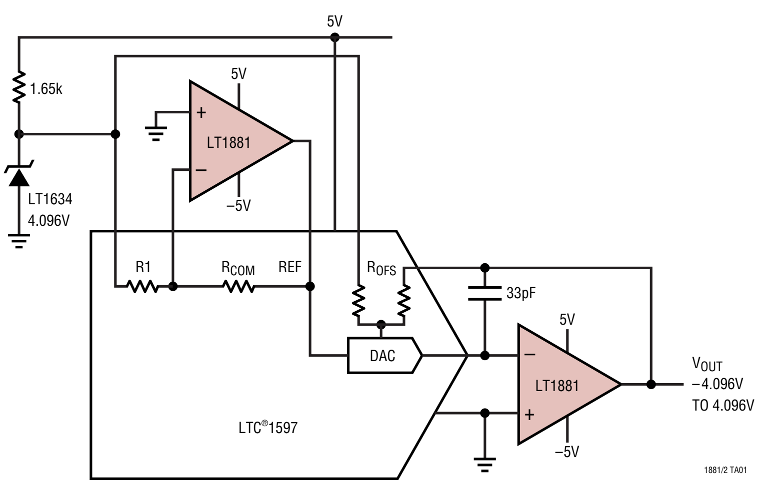
The amplifiers work on any total power supply voltage between 2.7V and 36V (fully specified from 5V to ±15V). Output voltage swings to within 40mV of the negative supply and 220mV of the positive supply make these amplifiers good choices for low voltage single supply operation.

Capacitive loads up to 1000pF can be driven directly in unity-gain follower applications.

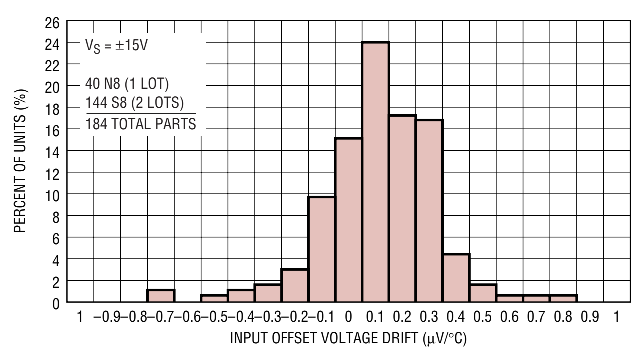
The dual LT1881 and LT1881A are available with standard pinouts in S8 and PDIP packages. The quad LT1882 is in a 14-pin SO package. For a higher speed device with similar DC specifications, see the LT1884/LT1885.

TYPICAL APPLICATION

16-Bit Voltage Output DAC on ±5V Supply



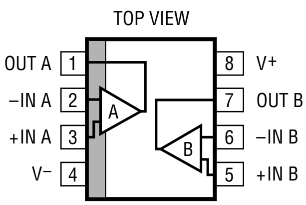
TC V_{OS} Distribution, Industrial Grade



ABSOLUTE MAXIMUM RATINGS (Note 1)

Supply Voltage (V^+ to V^-) 40V
Differential Input Voltage (Note 2) .... ±10V
Input Voltage .... V^+ to V^-
Input Current (Note 2) .... ±10mA
Output Short-Circuit Duration (Note 3) .... Indefinite
Operating Temperature Range (Note 4) .. –40°C to 85°C
Specified Temperature Range (Note 5) ... –40°C to 85°C
Maximum Junction Temperature .... 150°C
Storage Temperature Range .... –65°C to 150°C
Lead Temperature (Soldering, 10 sec) .... 300°C

PACKAGE/ORDER INFORMATION

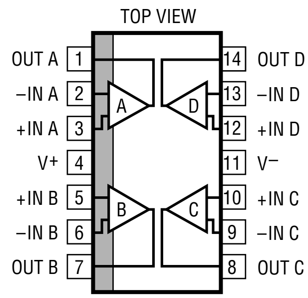


N8 PACKAGE 8-LEAD PDIP
S8 PACKAGE 8-LEAD PLASTIC SO

T_{JMAX} = 150°C, θ_{JA} = 130°C/W (N8)
T_{JMAX} = 150°C, θ_{JA} = 190°C/W (S8)

ORDER PART NUMBER
LT1881CN8
LT1881IN8
LT1881CS8
LT1881IS8
LT1881ACN8
LT1881AIN8
LT1881ACS8
LT1881AIS8

S8 PART MARKING
1881
1881I
1881A
1881AI



S PACKAGE 14-LEAD PLASTIC SO

T_{JMAX} = 150°C, θ_{JA} = 150°C/W

ORDER PART NUMBER
LT1882CS
LT1882IS

Order Options Tape and Reel: Add #TR
Lead Free: Add #PBF Lead Free Tape and Reel: Add #TRPBF
Lead Free Part Marking: http://www.linear.com/leadfree/

Consult LTC marketing for parts specified with wider operating temperature ranges.

ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C. Single supply operation V_S = 5V, 0V; V_{CM} = V_S/2 unless otherwise noted. (Note 5)

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
V_{OS}	Input Offset Voltage (LT1881A)				25	50	µV
		0°C < T_A < 70°C	●			85	µV
		–40°C < T_A < 85°C	●			110	µV
	Input Offset Voltage (LT1881/LT1882)				30	80	µV
		0°C < T_A < 70°C	●			125	µV
		–40°C < T_A < 85°C	●			150	µV
$\Delta V_{OS}/\Delta T$	Input Offset Voltage Drift (Note 6)	0°C < T_A < 70°C	●		0.3	0.8	µV/°C
		–40°C < T_A < 85°C	●		0.3	0.8	µV/°C
$\Delta V_{OS}/\Delta TIME$	Long-Term Input Offset Voltage Stability				0.3		µV/month
I_{OS}	Input Offset Current (LT1881A)				100	200	pA
		0°C < T_A < 70°C	●			250	pA
		–40°C < T_A < 85°C	●			300	pA
	Input Offset Current (LT1881/LT1882)				150	500	pA
		0°C < T_A < 70°C	●			600	pA
		–40°C < T_A < 85°C	●			700	pA

ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C. Single supply operation V_S = 5V, 0V; V_{CM} = V_S/2 unless otherwise noted. (Note 5)

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
I_B	Input Bias Current (LT1881A)				100	200	pA
		0°C < T_A < 70°C	●			250	pA
		–40°C < T_A < 85°C	●			300	pA
	Input Bias Current (LT1881/LT1882)				150	500	pA
		0°C < T_A < 70°C	●			600	pA
		–40°C < T_A < 85°C	●			700	pA
	Input Noise Voltage	0.1Hz to 10Hz			0.5		μV_{P-P}
e_n	Input Noise Voltage Density	f = 1kHz			14		$nV/\sqrt{Hz}$
i_n	Input Noise Current Density	f = 1kHz			0.03		$pA/\sqrt{Hz}$
R_{IN}	Input Resistance	Differential Mode	●		20		MΩ
		Common Mode	●		100		GΩ
C_{IN}	Input Capacitance		●		2		pF
V_{CM}	Input Voltage Range			V^- + 1.0		V^+ – 1.0	V
			●	V^- + 1.2		V^+ – 1.2	V
CMRR	Common Mode Rejection Ratio	1V < V_{CM} < 4V		106	128		dB
		1.2V < V_{CM} < 3.8V	●	104			dB
PSRR	Power Supply Rejection Ratio	V^- = 0V, V_{CM} = 1.5V					
		0°C < T_A < 85°C, 2.7V < V^+ < 32V	●	106	132		dB
		T_A = –40°C, 3V < V^+ < 32V		106	132		dB
	Minimum Operating Supply Voltage		●		2.4	2.7	V
A_{VOL}	Large-Signal Voltage Gain	R_L = 10k; 1V < V_{OUT} < 4V		500	1600		V/mV
			●	350			V/mV
		R_L = 2k; 1V < V_{OUT} < 4V		300	800		V/mV
			●	250			V/mV
		R_L = 1k; 1V < V_{OUT} < 4V		250	400		V/mV
			●	200			V/mV
V_{OL}	Output Voltage Swing Low	No Load	●		20	40	mV
		I_{SINK} = 100µA	●		25	50	mV
		I_{SINK} = 1mA	●		70	150	mV
		I_{SINK} = 5mA	●		270	600	mV
V_{OH}	Output Voltage Swing High (Referred to V^+)	No Load	●		120	220	mV
		I_{SOURCE} = 100µA	●		130	230	mV
		I_{SOURCE} = 1mA	●		180	300	mV
		I_{SOURCE} = 5mA	●		360	600	mV
I_S	Supply Current Per Amplifier	V_S = 3V, 0V		0.45	0.65	0.85	mA
			●			1.2	mA
		V_S = 5V, 0V		0.5	0.65	0.9	mA
			●			1.4	mA
		V_S = 12V, 0V		0.5	0.70	1.0	mA
			●			1.5	mA
I_{SC}	Short-Circuit Current	V_{OUT} Short to GND	●	15	30		mA
		V_{OUT} Short to V^+	●	15	30		mA
GBW	Gain Bandwidth Product	f = 20kHz		0.35	1.0		MHz
	Channel Separation	f = 1kHz			120		dB
t_S	Settling Time	0.01%, V_{OUT} = 1.5V to 3.5V, A_V = –1, R_L = 2k			30		µs

ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C. Single supply operation V_S = 5V, 0V; V_{CM} = V_S/2 unless otherwise noted. (Note 5)

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
SR^+	Slew Rate Positive	A_V = –1		0.15	0.35		V/µs
			●	0.12			V/µs
SR^-	Slew Rate Negative	A_V = –1		0.11	0.18		V/µs
			●	0.08			V/µs
FPBW	Full-Power Bandwidth	V_{OUT} = $4V_{P-P}$		8.75	14		kHz
		(Note 10)	●	6.35			kHz
ΔV_{OS}	Offset Voltage Match (LT1881A)	(Note 7)			30	70	µV
		0°C < T_A < 70°C	●			125	µV
		–40°C < T_A < 85°C	●			160	µV
	Offset Voltage Match (LT1881/LT1882)	(Note 7)			35	125	µV
		0°C < T_A < 70°C	●			175	µV
		–40°C < T_A < 85°C	●			235	µV
	Offset Voltage Match Drift	(Notes 6, 7)	●		0.4	1.2	µV/°C
ΔI_B+	Noninverting Bias Current Match (LT1881A)	(Notes 7, 8)			200	300	pA
		0°C < T_A < 70°C	●			400	pA
		–40°C < T_A < 85°C	●			500	pA
	Noninverting Bias Current Match (LT1881/LT1882)	(Notes 7, 8)			250	700	pA
		0°C < T_A < 70°C	●			900	pA
		–40°C < T_A < 85°C	●			1000	pA
ΔCMRR	Common Mode Rejection Match	(Notes 7, 9)	●	102	125		dB
ΔPSRR	Power Supply Rejection Match (Notes 7, 9)	V^- = 0V, V_{CM} = 1.5V					
		0°C < T_A < 85°C, 2.7V < V^+ < 32V	●	104	126		dB
		T_A = –40°C, 3V < V^+ < 32V		104	126		dB

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C. Split supply operation V_S = ±15V, V_{CM} = 0V unless otherwise noted. (Note 5)

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
V_{OS}	Input Offset Voltage (LT1881A)				25	50	µV
		0°C < T_A < 70°C	●			85	µV
		–40°C < T_A < 85°C	●			110	µV
	Input Offset Voltage (LT1881/LT1882)				30	80	µV
		0°C < T_A < 70°C	●			125	µV
		–40°C < T_A < 85°C	●			150	µV
$\Delta V_{OS}/\Delta T$	Input Offset Voltage Drift (Note 6)	0°C < T_A < 70°C	●		0.3	0.8	µV/°C
		–40°C < T_A < 85°C	●		0.3	0.8	µV/°C
$\Delta V_{OS}/\Delta TIME$	Long-Term Input Offset Voltage Stability				0.3		µV/month
I_{OS}	Input Offset Current (LT1881A)				150	200	pA
		0°C < T_A < 70°C	●			250	pA
		–40°C < T_A < 85°C	●			300	pA
	Input Offset Current (LT1881/LT1882)				150	500	pA
		0°C < T_A < 70°C	●			600	pA
		–40°C < T_A < 85°C	●			700	pA

ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C. Split supply operation V_S = ±15V, V_{CM} = 0V unless otherwise noted. (Note 5)

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
I_B	Input Bias Current (LT1881A)				150	200	pA
		0°C < T_A < 70°C	●			250	pA
		–40°C < T_A < 85°C	●			300	pA
	Input Bias Current (LT1881/LT1882)				150	500	pA
		0°C < T_A < 70°C	●			600	pA
		–40°C < T_A < 85°C	●			700	pA
	Input Noise Voltage	0.1Hz to 10Hz			0.5		μV_{P-P}
e_n	Input Noise Voltage Density	f = 1kHz			14		$nV/\sqrt{Hz}$
i_n	Input Noise Current Density	f = 1kHz			0.03		$pA/\sqrt{Hz}$
R_{IN}	Input Resistance	Differential Mode	●		20		MΩ
		Common Mode	●		100		GΩ
C_{IN}	Input Capacitance		●		2		pF
V_{CM}	Input Voltage Range			V^- + 1.0		V^+ – 1.0	V
			●	V^- + 1.2		V^+ – 1.2	V
CMRR	Common Mode Rejection Ratio	–13.5V < V_{CM} < 13.5V	●	114	130		dB
+PSRR	Positive Power Supply Rejection Ratio	V^- = –15V, V_{CM} = 0V; 1.5V < V^+ < 18V	●	110	132		dB
–PSRR	Negative Power Supply Rejection Ratio	V^+ = 15V, V_{CM} = 0V; –1.5V < V^- < –18V	●	106	132		dB
	Minimum Operating Supply Voltage		●		±1.2	±1.35	V
A_{VOL}	Large-Signal Voltage Gain	R_L = 10k; –13.5V < V_{OUT} < 13.5V		1000	1600		V/mV
			●	700			V/mV
		R_L = 2k; –13.5V < V_{OUT} < 13.5V		175	420		V/mV
			●	125			V/mV
		R_L = 1k; –12V < V_{OUT} < 12V		90	230		V/mV
			●	65			V/mV
V_{OL}	Output Voltage Swing Low (Referred to V_{EE})	No Load	●		20	40	mV
		I_{SINK} = 100µA	●		25	50	mV
		I_{SINK} = 1mA	●		70	150	mV
		I_{SINK} = 5mA	●		270	600	mV
V_{OH}	Output Voltage Swing High (Referred to V_{CC})	No Load	●		160	220	mV
		I_{SOURCE} = 100µA	●		160	230	mV
		I_{SOURCE} = 1mA	●		180	300	mV
		I_{SOURCE} = 5mA	●		360	600	mV
I_S	Supply Current Per Amplifier	V_S = ±15V		0.5	0.85	1.1	mA
			●			1.6	mA
I_{SC}	Short-Circuit Current	V_{OUT} Short to V^-		20	40		mA
			●	15	40		mA
		V_{OUT} Short to V^+		20	30		mA
			●	15	30		mA
GBW	Gain Bandwidth Product	f = 20kHz		0.4	0.85		MHz
	Channel Separation	f = 1kHz			120		dB
t_S	Settling Time	0.01%, V_{OUT} = –5V to 5V, A_V = –1, R_L = 2k			35		µs
SR^+	Slew Rate Positive	A_V = –1		0.21	0.4		V/µs
			●	0.18			V/µs

ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C. Split supply operation V_S = ±15V, V_{CM} = 0V unless otherwise noted. (Note 5)

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
SR^-	Slew Rate Negative	A_V = –1	 ●	0.13 0.1	0.20		V/µs V/µs
FPBW	Full-Power Bandwidth	V_{OUT} = $28V_{P-P}$ (Note 10)	 ●	1.47 1.13	2.25		kHz kHz
ΔV_{OS}	Offset Voltage Match (LT1881/LT1882)	(Note 5) 0°C < T_A < 70°C –40°C < T_A < 85°C	 ● ●		42	125 175 235	µV µV µV
	Offset Voltage Match (LT1881A)	 0°C < T_A < 70°C –40°C < T_A < 85°C	 ● ●		35	70 125 160	µV µV µV
	Offset Voltage Match Drift	(Notes 6, 7)	●		0.4	1.1	µV/°C
ΔI_B+	Noninverting Bias Current Match (LT1881/LT1882)	(Notes 7, 8) 0°C < T_A < 70°C –40°C < T_A < 85°C	 ● ●		240	700 900 1000	pA pA pA
	Noninverting Bias Current Match (LT1881A)	 0°C < T_A < 70°C –40°C < T_A < 85°C	 ● ●		200	300 400 500	pA pA pA
ΔCMRR	Common Mode Rejection Match	(Notes 7, 9)	●	110	125		dB
Δ+PSRR	Positive Power Supply Rejection Match	V^- = –15V, V_{CM} = 0V, 1.5V < V^+ < 18V, (Notes 7, 9)	●	108	130		dB
Δ–PSRR	Negative Power Supply Rejection Match	V^+ = 15V, V_{CM} = 0V, –1.5V < V^- < –18V, (Notes 7, 9)	●	104	130		dB

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

Note 2: The inputs are protected by internal resistors and back-to-back diodes. If the differential input voltage exceeds ±0.7V, the input current should be limited externally to less than 10mA.

Note 3: A heat sink may be required to keep the junction temperature below absolute maximum.

Note 4: The LT1881C, LT1882C, LT1881I and LT1882I are guaranteed functional over the operating temperature range of –40°C to 85°C.

Note 5: The LT1881C and LT1882C are designed, characterized and expected to meet specified performance from –40°C to 85°C but are not tested or QA sampled at these temperatures. The LT1881I and LT1882I are guaranteed to meet specified performance from –40°C to 85°C.

Note 6: This parameter is not 100% tested.

Note 7: Matching parameters are the difference between amplifiers A and B in the LT1881; and between amplifiers A and D and B and C in the LT1882.

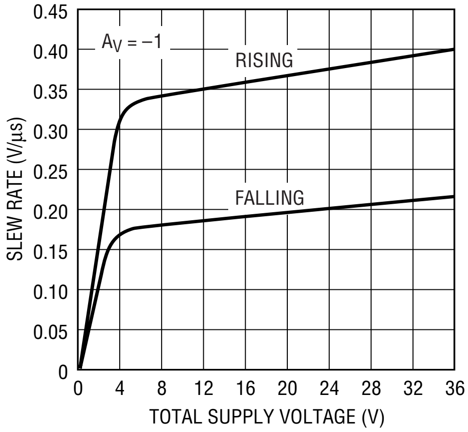
Note 8: This parameter is the difference between the two noninverting input bias currents.

Note 9: ΔCMRR and ΔPSRR are defined as follows: CMRR and PSRR are measured in µV/V on each amplifier. The difference is calculated in µV/V and then converted to dB.

Note 10: Full power bandwidth is calculated from the slew rate: FPBW = $SR/2\pi V_P$.

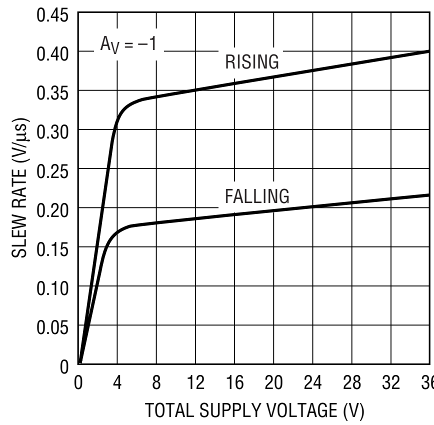
TYPICAL PERFORMANCE CHARACTERISTICS

Supply Current per Amplifier vs Supply Voltage



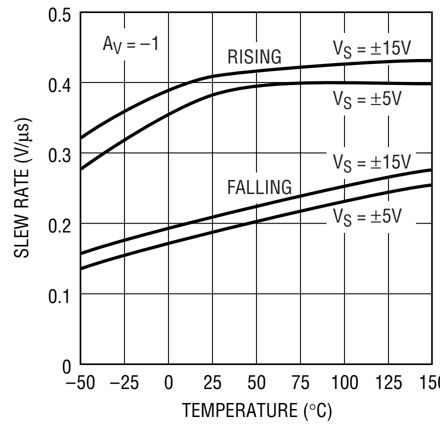
1881/2 G02

Slew Rate vs Supply Voltage



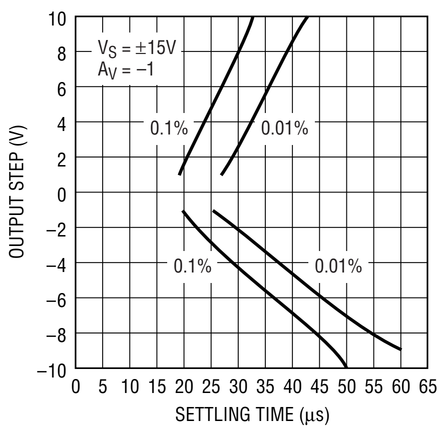
1881/2 G02

Slew Rate vs Temperature



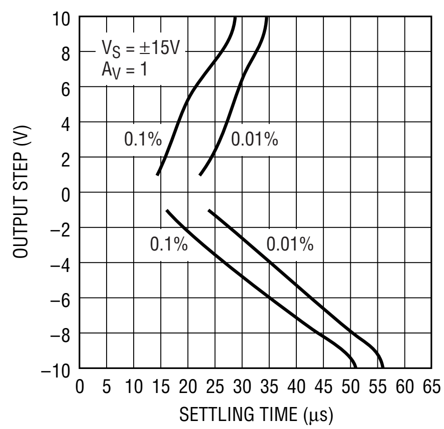
1881/2 G03

Settling Time vs Output Step



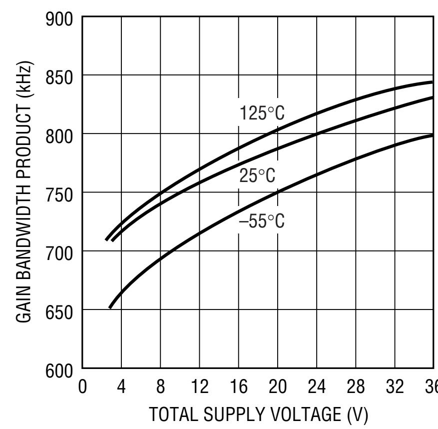
1881/2 G04

Settling Time vs Output Step



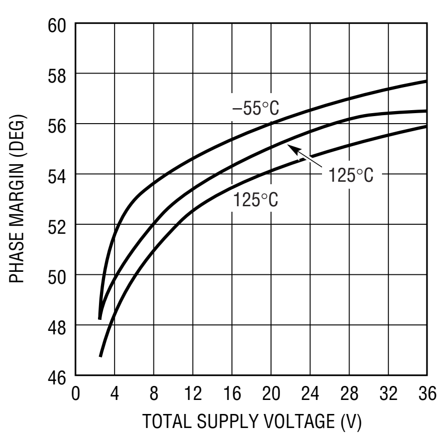
1881/2 G05

Gain Bandwidth Product vs Supply Voltage



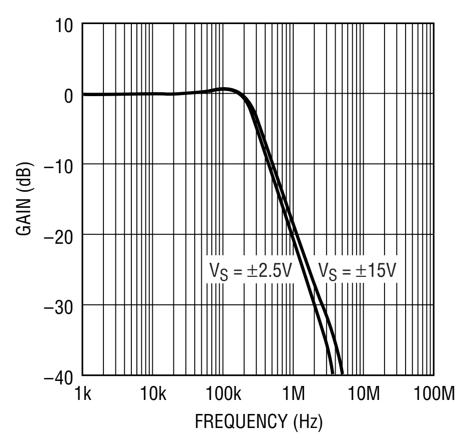
1881/2 G06

Phase Margin vs Supply Voltage



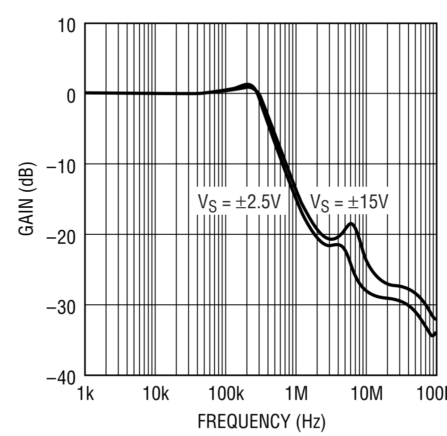
1881/2 G07

Gain vs Frequency, A_V = –1



1881/2 G08

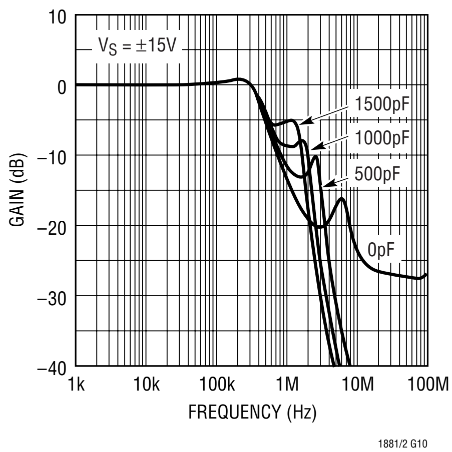
Gain vs Frequency, A_V = 1



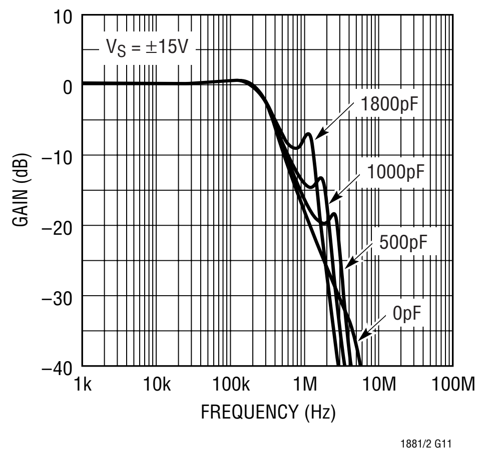
1881/2 G09

TYPICAL PERFORMANCE CHARACTERISTICS

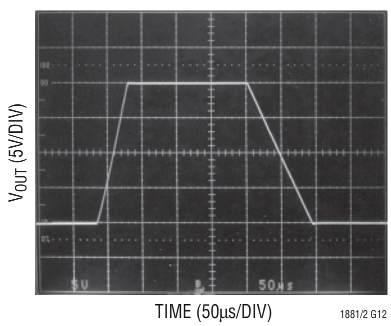
Gain vs Frequency with C_{LOAD}, $A_V = 1$



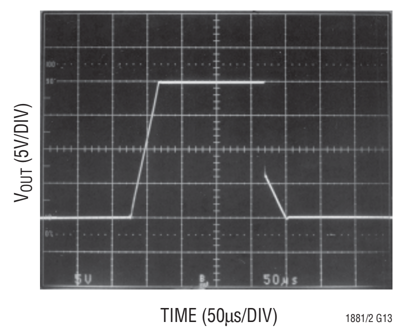
Gain vs Frequency with C_{LOAD}, $A_V = -1$



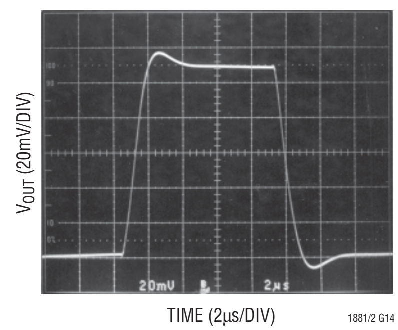
Large Signal Response, $A_V = -1$



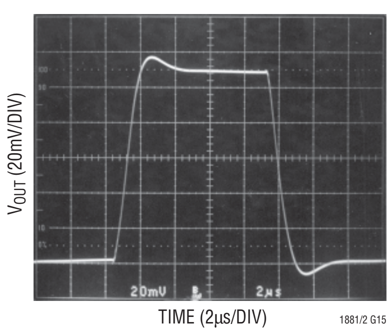
Large Signal Response, $A_V = 1$



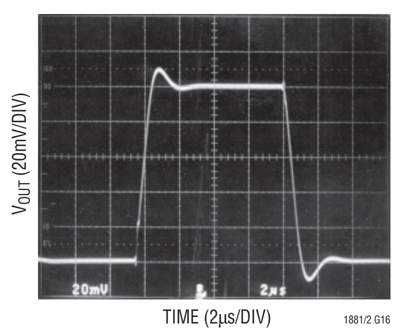
Small Signal Response, $A_V = -1$, No Load



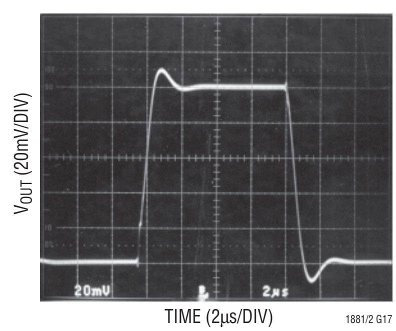
Small Signal Response, $A_V = -1$, $C_L = 1000pF$



Small Signal Response, $A_V = 1$, $R_L = 2k$

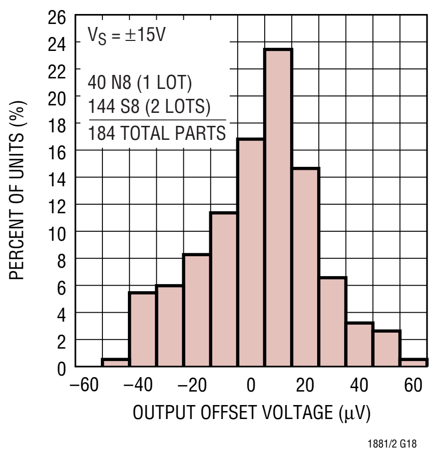


Small Signal Response, $A_V = 1$, $C_L = 500pF$

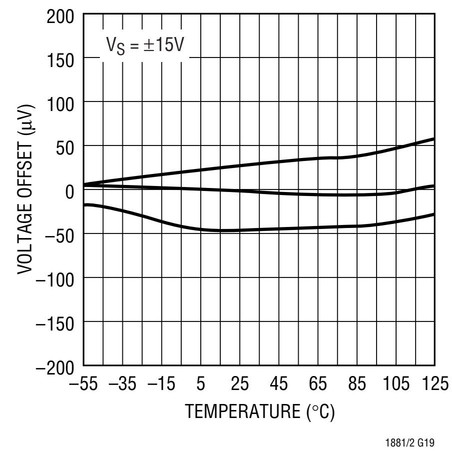


TYPICAL PERFORMANCE CHARACTERISTICS

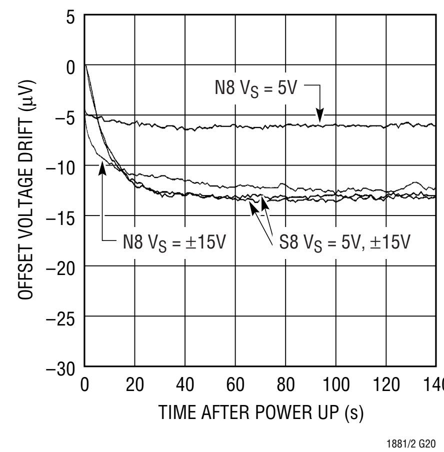
LT1881 V_{OS} Distribution, $T_A = 25°C$



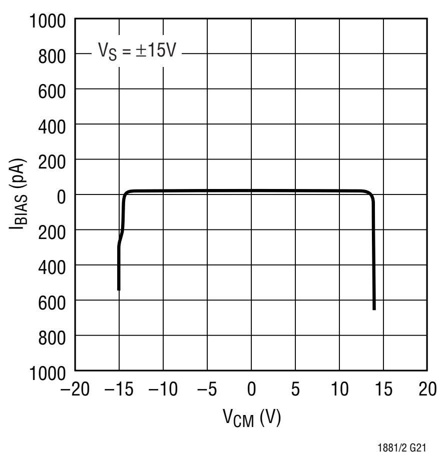
LT1881IS8 Voltage Offset vs Temperature



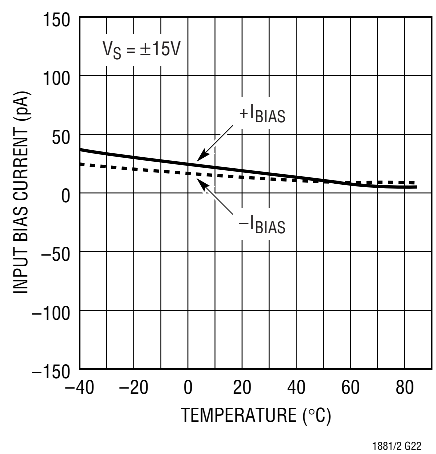
Warm-Up Drift vs Time



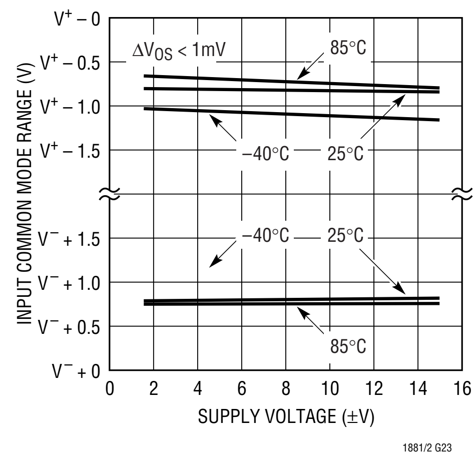
LT1881 Input Bias Current vs Common Mode Voltage



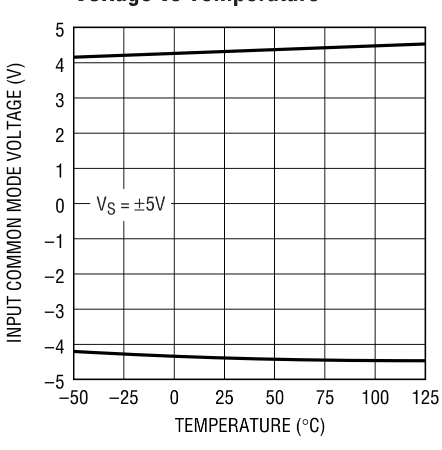
LT1881 Input Bias Current vs Temperature



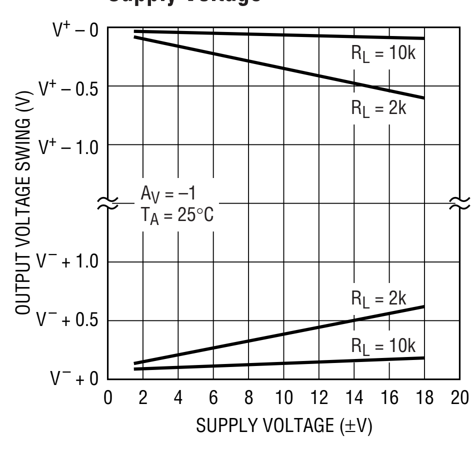
LT1881 Input Common Mode Range vs Supply Voltage



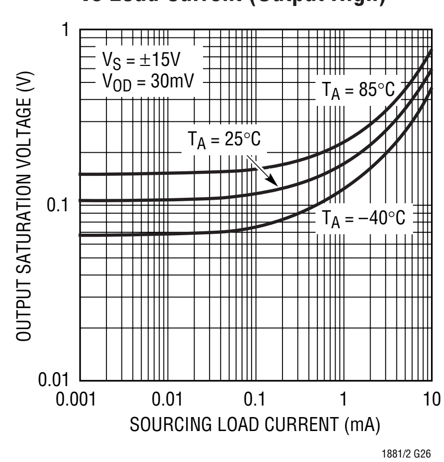
LT1881 Input Common Mode Voltage vs Temperature



LT1881 Output Voltage Swing vs Supply Voltage

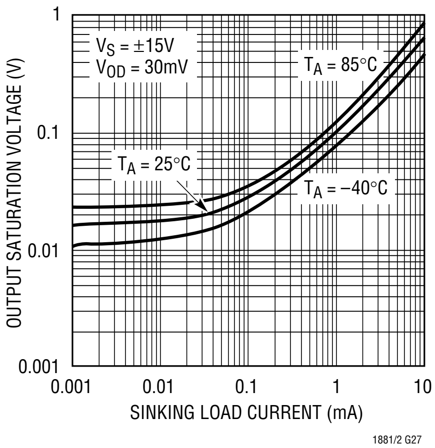


LT1881 Output Saturation Voltage vs Load Current (Output High)

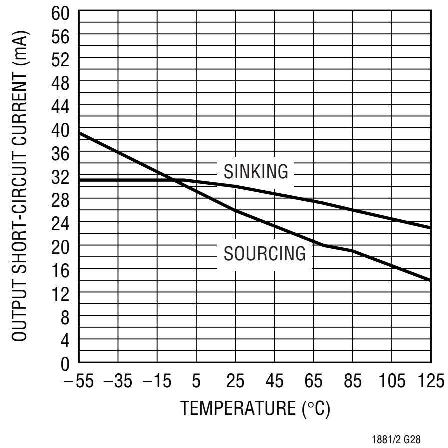


TYPICAL PERFORMANCE CHARACTERISTICS

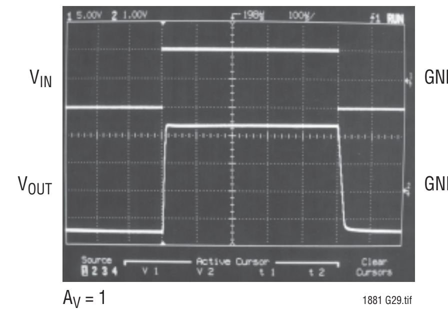
LT1881 Output Saturation Voltage vs Load Current (Output Low)



LT1881 Output Short-Circuit Current vs Temperature

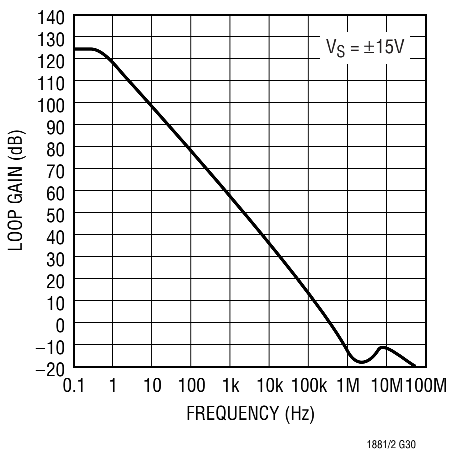


LT1881 Output Voltage vs Large Input Voltage

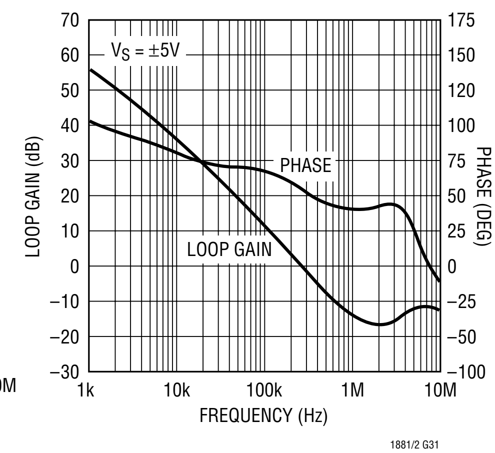


$A_V = 1$
$V_S = \pm2.5V$
$V_{IN} = \pm5V$
$R_{IN} = 10k$

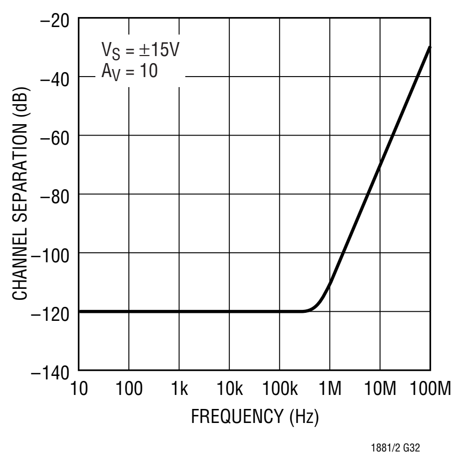
LT1881 Open-Loop Gain vs Frequency



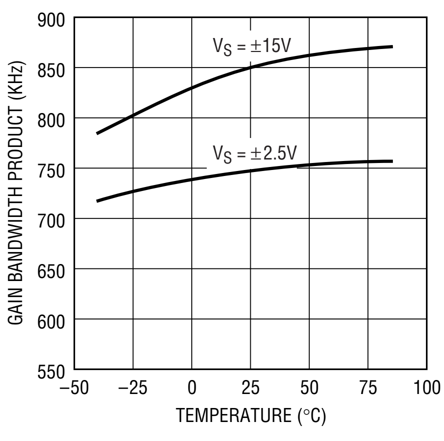
LT1881 Open-Loop Gain and Phase vs Frequency



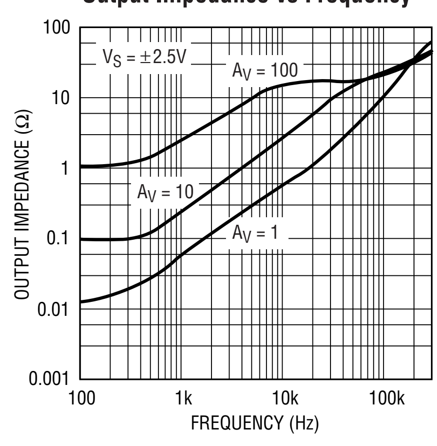
LT1881 Channel Separation vs Frequency



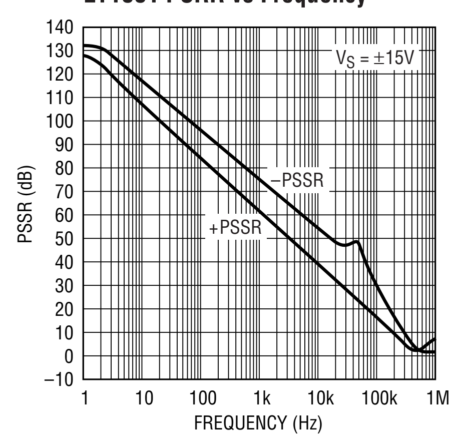
Gain Bandwidth Product vs Temperature



Output Impedance vs Frequency

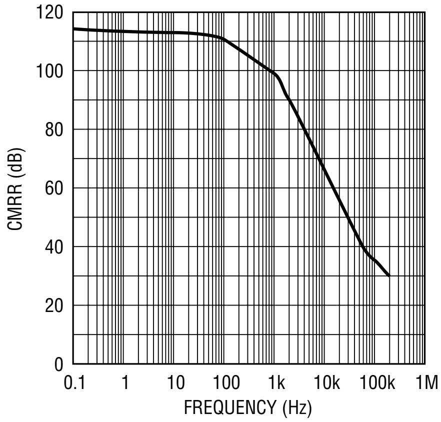


LT1881 PSRR vs Frequency



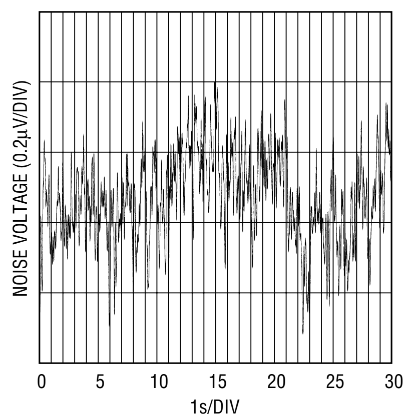
TYPICAL PERFORMANCE CHARACTERISTICS

Common Mode Rejection Ratio vs Frequency



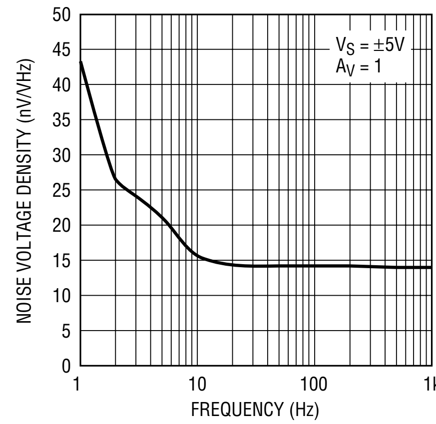
1881/2 G36

LT1881 0.1Hz to 10Hz Noise



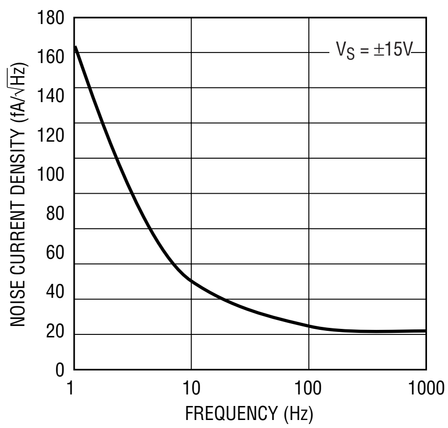
1881/2 G37

LT1881 Noise Voltage vs Frequency



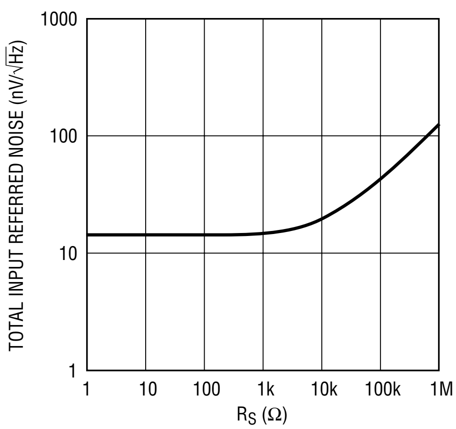
1881/2 G38

LT1881 Noise Current Density vs Frequency



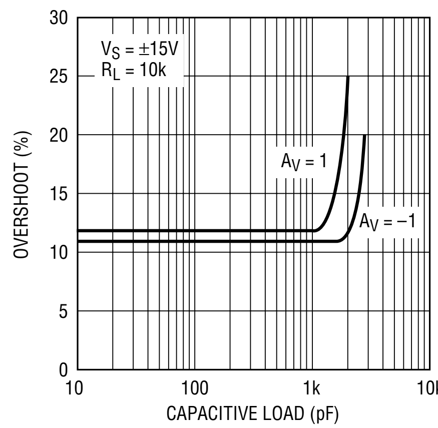
1881/2 G39

LT1881A Total Noise vs Source Resistance



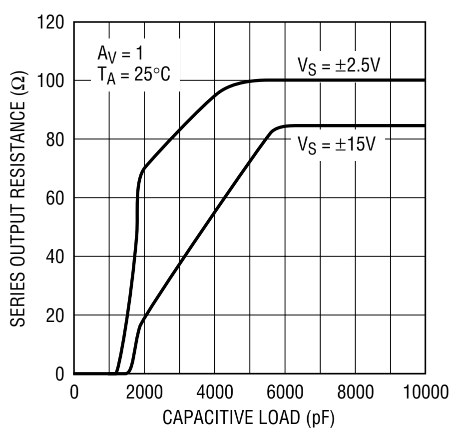
1881/2 G36

LT1881 Overshoot vs Capacitive Load



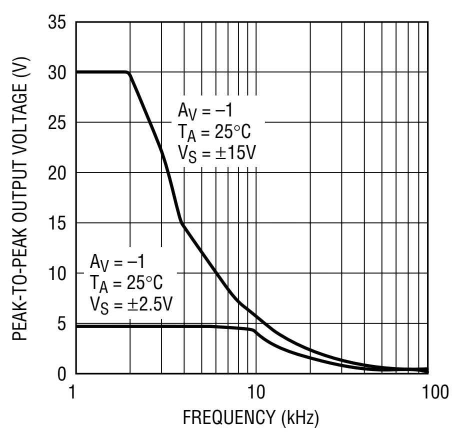
1881/2 G41

LT1881 Series Output Resistance vs Capacitive Load



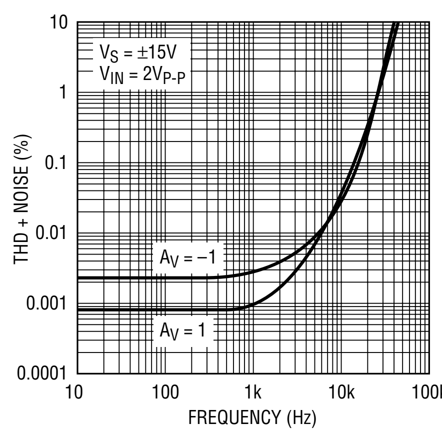
1881/2 G42

LT1881 Undistorted Output Swing vs Frequency



1881/2 G43

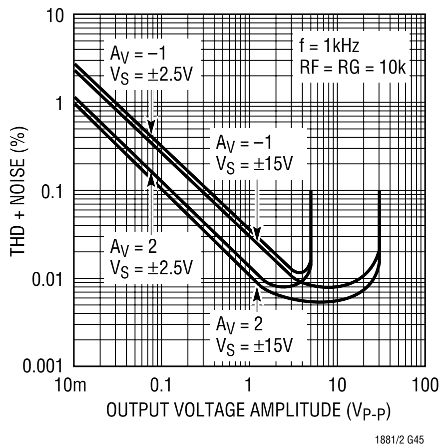
LT1881 THD + Noise vs Frequency



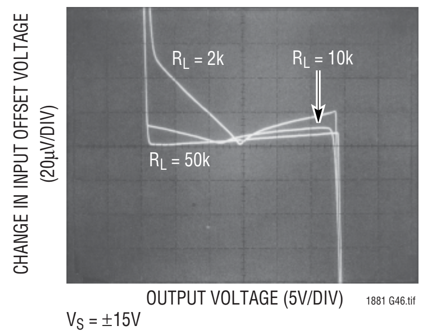
1881/2 G44

TYPICAL PERFORMANCE CHARACTERISTICS

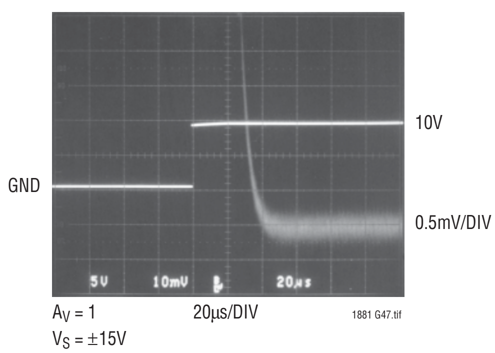
LT1881 Total Harmonic Distortion + Noise vs Output Voltage Amplitude



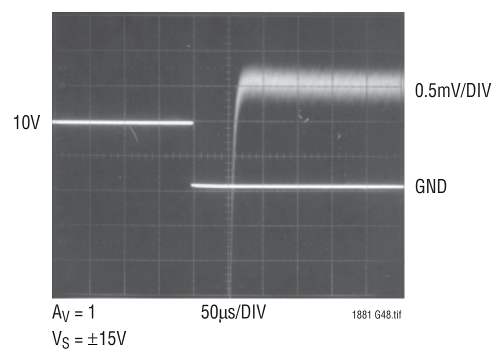
LT1881 Open-Loop Gain



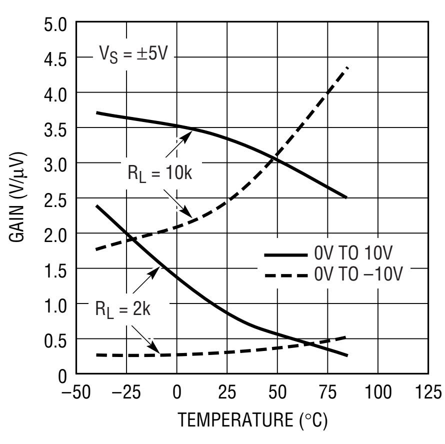
LT1881 Settling Time/ Output Step 0.01%



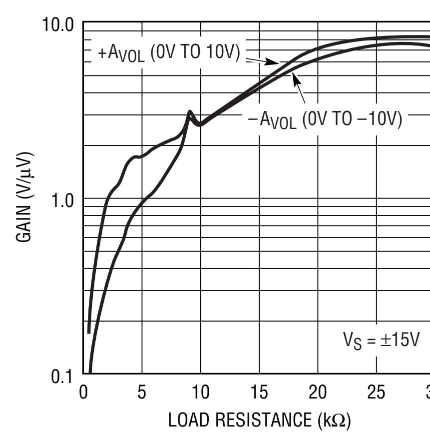
LT1881 Settling Time/ Output Step 0.01%



LT1881 Gain vs Temperature



LT1881 Gain vs Load Resistance



APPLICATIONS INFORMATION

The LT1881 dual and LT1882 quad op amps feature exceptional input precision with rail-to-rail output swing. The amplifiers are similar to the LT1884 and LT1885 devices. The LT1881 and LT1882 offer superior capacitive load driving capabilities over the LT1884 and LT1885 in low voltage gain configurations. Offset voltages are trimmed to less than 50µV and input bias currents are less than 200pA on the "A" grade devices. Obtaining beneficial advantage of these precision input characteristics depends upon proper applications circuit design and board layout.

Preserving Input Precision

Preserving the input voltage accuracy of the LT1881/LT1882 requires that the applications circuit and PC board layout do not introduce errors comparable to or greater than the 30µV offset. Temperature differentials across the input connections can generate thermocouple voltages of 10's of microvolts. PC board layouts should keep connections to the amplifier's input pins close together and away from heat dissipating components. Air currents across the board can also generate temperature differentials.

The extremely low input bias currents, 150pA, allow high accuracy to be maintained with high impedance sources and feedback networks. The LT1881/LT1882's low input bias currents are obtained by using a cancellation circuit on-chip. This causes the resulting I_{BIAS}+ and I_{BIAS}– to be uncorrelated, as implied by the I_{OS} specification being greater than the I_{BIAS}. The user should not try to balance the input resistances in each input lead, as is commonly recommended with most amplifiers. The impedance at either input should be kept as small as possible to minimize total circuit error.

PC board layout is important to insure that leakage currents do not corrupt the low I_{BIAS} of the amplifier. In high precision, high impedance circuits, the input pins should be surrounded by a guard ring of PC board interconnect, with the guard driven to the same common mode voltage as the amplifier inputs.

Input Common Mode Range

The LT1881 and LT1882 outputs are able to swing nearly to each power supply rail, but the input stage is limited to operating between V^- +1V and V^+ –1V. Exceeding this common mode range will cause the gain to drop to zero; however, no phase reversal will occur.

Input Protection

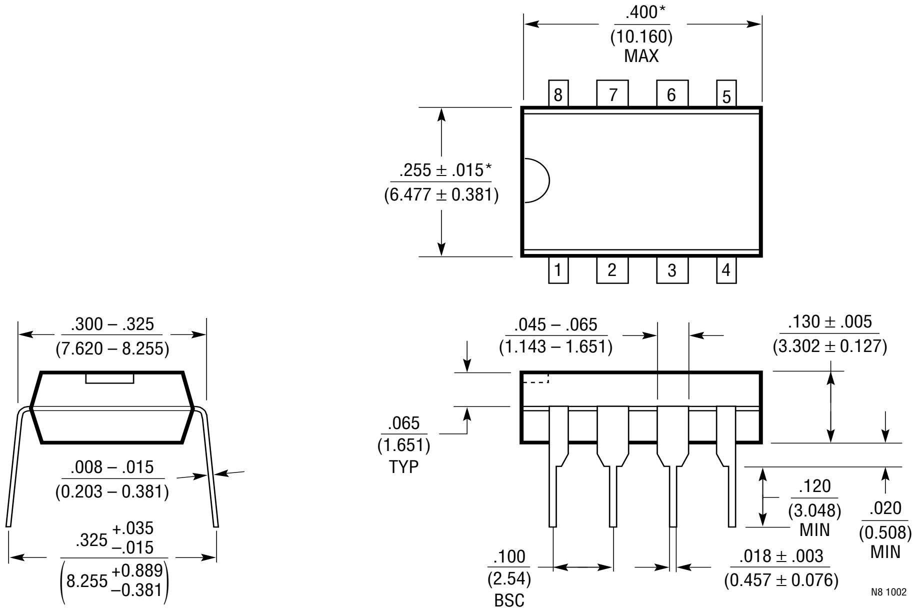
The inverting and noninverting input pins of the LT1881 and LT1882 have limited on-chip protection. ESD protection is provided to prevent damage during handling. The input transistors have voltage clamping and limiting resistors to protect against input differentials up to 10V. Short transients above this level will also be tolerated. If the input pins can see a sustained differential voltage above 10V, external limiting resistors should be used to prevent damage to the amplifier. A 1k resistor in each input lead will provide protection against a 30V differential voltage.

Capacitive Loads

The LT1881 and LT1882 can drive capacitive loads up to 1000pF in unity-gain. The capacitive load driving increases as the amplifier is used in higher gain configurations. Capacitive load driving may be increased by decoupling the capacitance from the output with a small resistance.

PACKAGE DESCRIPTION

N8 Package
8-Lead PDIP (Narrow 0.300)
(LTC DWG # 05-08-1510)

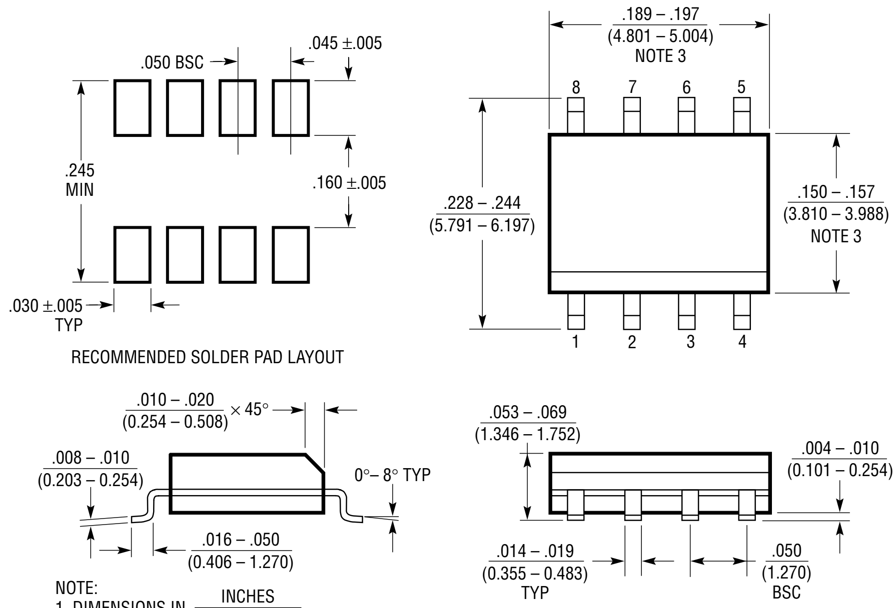


NOTE:
1. DIMENSIONS ARE $\frac{\text{INCHES}}{\text{MILLIMETERS}}$

*THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED .010 INCH (0.254mm)

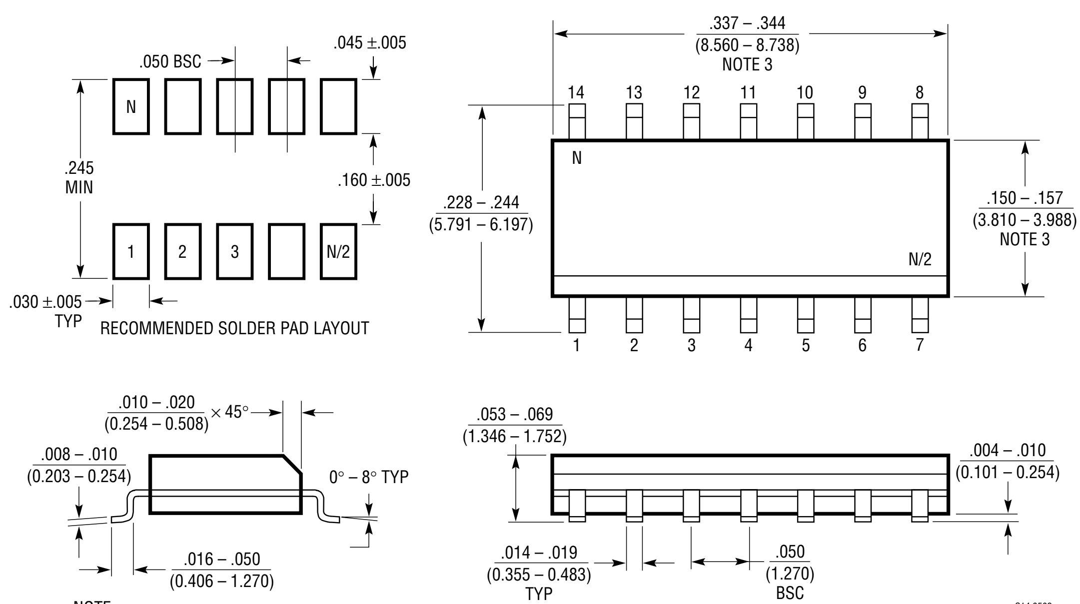
PACKAGE DESCRIPTION

S8 Package
8-Lead Plastic Small Outline (Narrow 0.150)
(LTC DWG # 05-08-1610)



NOTE:
1. DIMENSIONS IN $\frac{\text{INCHES}}{\text{(MILLIMETERS)}}$
2. DRAWING NOT TO SCALE
3. THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED .006" (0.15mm)

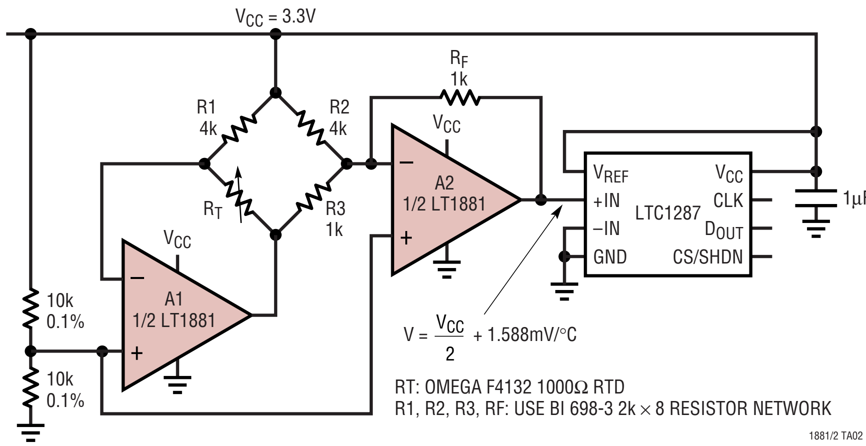
S Package
14-Lead Plastic Small Outline (Narrow 0.150)
(LTC DWG # 05-08-1610)



NOTE:
1. DIMENSIONS IN $\frac{\text{INCHES}}{\text{(MILLIMETERS)}}$
2. DRAWING NOT TO SCALE
3. THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED .006" (0.15mm)

TYPICAL APPLICATION

–50°C to 600°C Digital Thermometer Operates on 3.3V



RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LT1112/LT1114	Dual/Quad Picoamp Input Op Amp	V_{OS} = 60µV Max
LT1167	Gain Programmable Instrumentation Amp	Gain Error = 0.08% Max
LT1677	Low Noise, Rail-to-Rail Precision Op Amp	$e_n = 3.2nV/\sqrt{Hz}$
LT1793	Low Noise JFET Op Amp	I_B = 10pA Max
LT1880	SOT-23 Picoamp Input Precision Op Amp	150µV Max V_{OS}, –40°C to 85°C Operation Guaranteed, SOT-23 Package
LT1884/LT1885	Dual/Quad Picoamp Input Op Amp	3 Times Faster than LT1881/LT1882
LTC2050	Zero Drift Op Amp in SOT-23	V_{OS} = 3µV Max, Rail-to-Rail Output

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