34 MHz, CBFET Fast Settling Op Amp

AD843

FEATURES

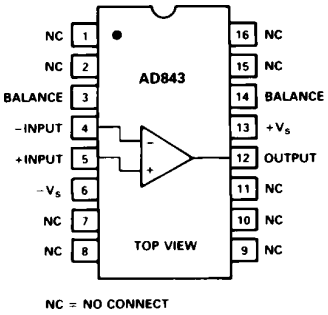
AC PERFORMANCE
- Unity Gain Bandwidth: 34 MHz
- Fast Settling: 135 ns to 0.01%
- Slew Rate: 250 V/μs
- Stable at Gains of 1 or Greater
- Full Power Bandwidth: 3.9 MHz

DC PERFORMANCE
- Input Offset Voltage: 1 mV max (AD843K/B)
- Input Bias Current: 0.6 nA typ
- Input Voltage Noise: 19 nV/√Hz
- Open Loop Gain: 30 V/mV into a 500 Ω Load
- Output Current: 50 mA min
- Supply Current: 13 mA max
- Available in 8-Pin Plastic Mini-DIP & Cerdip, 16-Pin SOIC, 20-Pin LCC and 12-Pin Hermetic Metal Can Packages
- Available in Tape and Reel in Accordance with EIA-481A Standard
- Chips and MIL-STD-883B Parts Also Available

APPLICATIONS
- High Speed Sample-and-Hold Amplifiers
- High Bandwidth Active Filters
- High Speed Integrators
- High Frequency Signal Conditioning

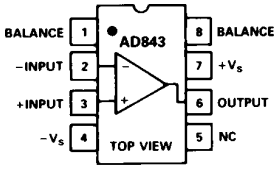
CONNECTION DIAGRAMS

16-Pin SOIC (R-16) Package



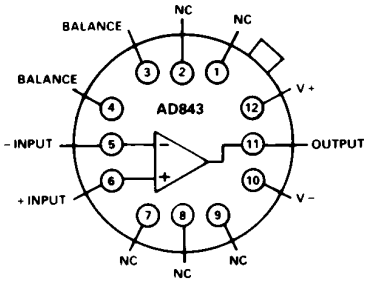
NC = NO CONNECT

Plastic (N-8) and Cerdip (Q-8) Package

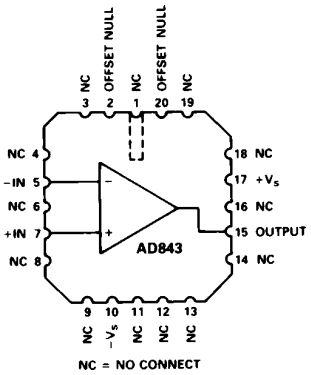


NC = NO CONNECT

TO-8 (H-12A) Package



LCC (E-20A) Package



PRODUCT DESCRIPTION

The AD843 is a fast settling, 34 MHz, CBFET input op amp. The AD843 combines the low (0.6 nA) input bias currents characteristic of a FET input amplifier while still providing a 34 MHz bandwidth and a 135 ns settling time (to within 0.01% of final value for a 10 volt step). The AD843 is a member of the Analog Devices' family of wide bandwidth operational amplifiers. These devices are fabricated using Analog Devices' junction isolated complementary bipolar (CB) process. This process permits a combination of dc precision and wideband ac performance previously unobtainable in a monolithic op amp.

The 250 V/μs slew rate and 0.6 nA input bias current of the AD843 ensure excellent performance in high speed sample-and-hold applications and in high speed integrators. This amplifier is also ideally suited for high bandwidth active filters and high frequency signal conditioning circuits.

Unlike many high frequency amplifiers, the AD843 requires no external compensation and it remains stable over its full operating temperature range. It is available in five performance grades: the AD843J and AD843K are rated over the commercial temperature range of 0°C to +70°C. The AD843A and AD843B are rated over the industrial temperature range of –40°C to +85°C. The AD843S is rated over the military temperature range of –55°C to +125°C and is available processed to MIL-STD-883B, Rev. C.

The AD843 is offered in either 8-pin plastic DIP or hermetic cerdip packages, in 16-pin SOIC, 20-Pin LCC, or in a 12-pin metal can. Chips are also available.

PRODUCT HIGHLIGHTS

1. The high slew rate, fast settling time and low input bias current of the AD843 make it the ideal amplifier for 12-bit D/A and A/D buffers, for high speed sample-and-hold amplifiers and for high speed integrator circuits. The AD843 can replace many FET input hybrid amplifiers such as the LH0032, LH4104 and OPA600.
2. Fully differential inputs provide outstanding performance in all standard high frequency op amp applications such as signal conditioning and active filters.
3. Laser wafer trimming reduces the input offset voltage to 1 mV max (AD843K and AD843B).
4. Although external offset nulling is unnecessary in many applications, offset null pins are provided.
5. The AD843 does not require external compensation at closed loop gains of 1 or greater.

REV. D

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AD843–SPECIFICATIONS (@ T_A = +25°C and ±15 V dc, unless otherwise noted)

Model	Conditions	AD843J/A Min	AD843J/A Typ	AD843J/A Max	AD843K/B Min	AD843K/B Typ	AD843K/B Max	AD843S[1] Min	AD843S[1] Typ	AD843S[1] Max	Units
INPUT OFFSET VOLTAGE[1]			1.0	**2.0**		0.5	**1.0**		1.0	**2.0**	mV
	T_{MIN}-T_{MAX}		1.7	4.0		1.2	**2.0**		3.0	**4.5**	mV
Offset Drift			12			12	35		12		µV/°C
INPUT BIAS CURRENT	Initial (T_J = +25°C)		50			40			50		pA
	Warmed-Up[2]		0.8	**2.5**		0.6	**1.0**		0.8	**2.5**	nA
	T_{MIN}-T_{MAX}			60/160			23/65			2600	nA
INPUT OFFSET CURRENT	Initial (T_J = +25°C)		30			20			30		pA
	Warmed-Up[2]		0.25	**1.0**		0.2	**0.4**		0.25	**1.0**	nA
	T_{MIN}-T_{MAX}			23/64			9/26			1025	nA
INPUT CHARACTERISTICS											
Input Resistance			10^{10}			10^{10}			10^{10}		Ω
Input Capacitance			6			6			6		pF
INPUT VOLTAGE RANGE											
Common Mode		**±10**	+12, –13		**±10**	+12, –13		**±10**	+12, –13		V
COMMON-MODE REJECTION	V_{CM} = ±10 V	**60**	72		**70**	76		**60**	72		dB
	T_{MIN}-T_{MAX}	60	72		**68**	76		**60**	72		dB
INPUT VOLTAGE NOISE	f = 10 kHz		19			19			19		nV/√Hz
Wideband Noise	10 Hz to 10 MHz		60			60			60		µV rms
OPEN LOOP GAIN	V_O = ±10 V										
	R_{LOAD} ≥ 500 Ω	**15**	25		**20**	30		**15**	30		V/mV
	T_{MIN}-T_{MAX}	10	20		**10**	25		**10**	25		V/mV
OUTPUT CHARACTERISTICS											
Voltage	R_{LOAD} ≥ 500 Ω	**±10**	+11.5, –12.6		**±10**	+11.5, –12.6		**±10**	+11.5, –12.6		V
Current	V_{OUT} = ±10 V	**50**			**50**			**50**			mA
Output Resistance	Open Loop		12			12			12		Ω
FREQUENCY RESPONSE											
Unity Gain Bandwidth	V_{OUT} = 90 mV p-p		34			34			34		MHz
Full Power Bandwidth[3]	V_O = 20 V p-p										
	R1 ≥ 500 Ω	2.5	3.9		2.5	3.9		2.5	3.9		MHz
Rise Time	A_{VCL} = –1		10			10			10		ns
Overshoot	A_{VCL} = –1		15			15			15		%
Slew Rate	A_{VCL} = –1	160	250		160	250		160	250		V/µs
Settling Time	10 V Step										
	A_{VCL} = –1										
	to 0.1%		95			95			95		ns
	to 0.01%		135			135			135		ns
Overdrive Recovery	–Overdrive		200			200			200		ns
	+Overdrive		700			700			700		ns
Differential Gain	f = 4.4 MHz		0.025			0.025			0.025		%
Differential Phase	f = 4.4 MHz		0.025			0.025			0.025		Degree
POWER SUPPLY											
Rated Performance			±15			±15			±15		V
Operating Range		**±4.5**		**±18**	**±4.5**		**±18**	**±4.5**		**±18**	V
Quiescent Current			12	**13**		12	**13**		12	**13**	mA
	T_{MIN}-T_{MAX}		12.3	14		12.3	**14**		12.5	**16**	mA
Rejection Ratio	±5 V to ±18 V	**65**	76		**70**	80		**65**	76		dB
Rejection Ratio	T_{MIN}-T_{MAX}	62	76		**68**	80		**62**	76		dB
TEMPERATURE RANGE											
Operating, Rated Performance											
Commercial (0°C to +70°C)			AD843J			AD843K					
Industrial (–40°C to +85°C)			AD843A			AD843B					
Military (–55°C to +125°C)[4]									AD843S		
PACKAGE OPTIONS											
Plastic (N-8)			AD843JN			AD843KN					
Cerdip (Q-8)			AD843AQ			AD843BQ			AD843SQ, AD843SQ/883B		
Metal Can (H-12A)						AD843BH			AD843SH, AD843SH/883B		
LCC (E-20A)									AD843SE/883B		
SOIC (R-16)			AD843JR–16								
Tape & Reel			AD843JR-16–REEL								
			AD843JR-16–REEL7								
Chips			AD843JCHIPS						AD843SCHIPS		

NOTES
[1]Standard Military Drawings Available: 5962-9098001M2A (SE/883B), 5962-9098001MXA (SH/883B), 5962-9098001MPA (SQ/883B).
[2]Specifications are guaranteed after 5 minutes at T_A = +25°C.
[3]Full power bandwidth = Slew Rate/2 πV peak.
[4]All "S" grade T_{MIN}-T_{MAX} specifications are tested with automatic test equipment at T_A = –55°C and T_A = +125°C.

Specifications subject to change without notice.

Specifications in **boldface** are tested on all production units at final electrical test. Results from those tests are used to calculate outgoing quality levels. All min and max specifications are guaranteed although only those shown in **boldface** are tested on all production units.

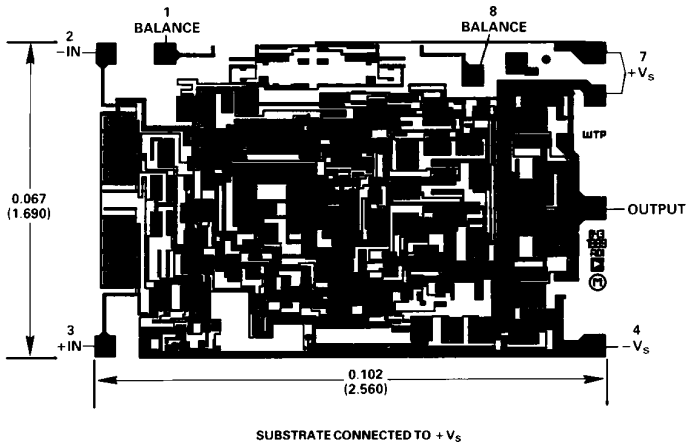
ABSOLUTE MAXIMUM RATINGS[1]

Supply Voltage . . . . . ±18 V
Internal Power Dissipation[2]
  Plastic Package . . . . . 1.50 Watts
  Cerdip Package . . . . . 1.35 Watts
  12-Pin Header Package . . . . . 1.80 Watts
  16-Pin SOIC Package . . . . . 1.50 Watts
  20-Pin LCC Package . . . . . 1.00 Watt
Input Voltage . . . . . $\pm V_S$
Output Short Circuit Duration . . . . . Indefinite
Differential Input Voltage . . . . . $+V_S$ and $-V_S$
Storage Temperature Range (N, R) . . . . . –65°C to +125°C
Storage Temperature Range (Q, H, E) . . . . –65°C to +150°C
Operating Temperature Range
  AD843J/R . . . . . 0°C to +70°C
  AD843A/B . . . . . –40°C to +85°C
  AD843S . . . . . –55°C to +125°C
Lead Temperature Range (Soldering 60 sec) . . . . . +300°C
ESD Rating . . . . . 500 V

NOTES
[1]Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
[2]8-Pin Plastic Package: θ_{JA} = 100°C/Watt
8-Pin Cerdip Package: θ_{JA} = 110°C/Watt
12-Pin Header Package: θ_{JA} = 80°C/Watt
16-Pin SOIC Package: θ_{JA} = 100°C/Watt
20-Pin LCC Package: θ_{JA} = 150°C/Watt

METALIZATION PHOTOGRAPH

Contact factory for latest dimensions.
Dimensions shown in inches and (mm).



AD843–Typical Characteristics

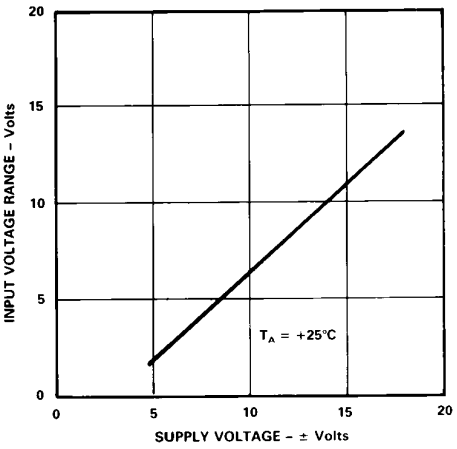


Figure 1. Input Voltage Range vs. Supply Voltage

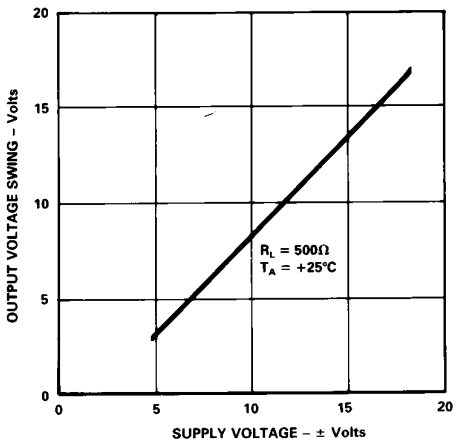


Figure 2. Output Voltage Swing vs. Supply Voltage

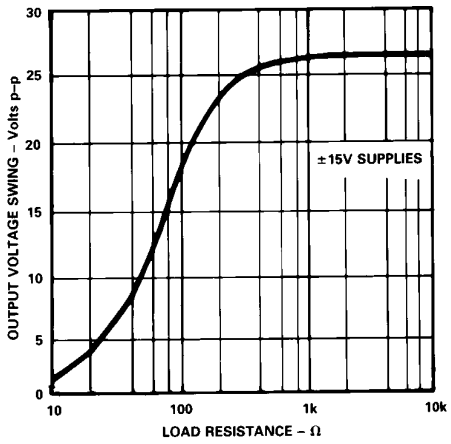


Figure 3. Output Voltage Swing vs. Load Resistance

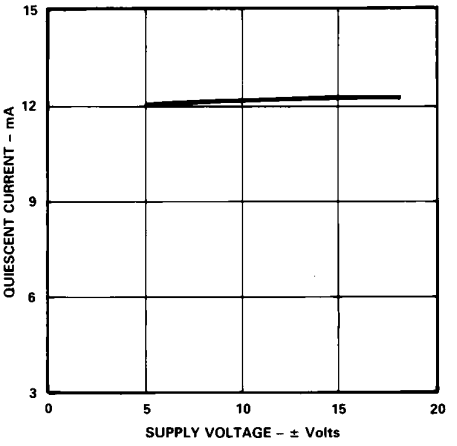


Figure 4. Quiescent Current vs. Supply Voltage

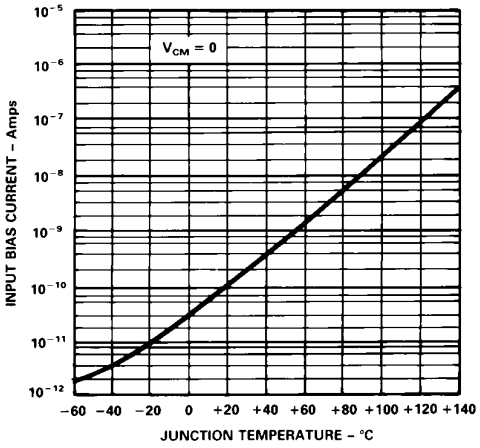


Figure 5. Input Bias Current vs. Junction Temperature

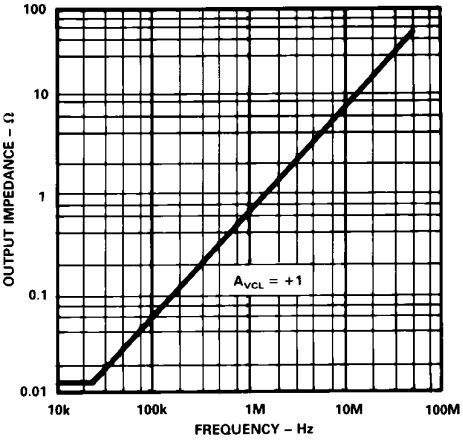


Figure 6. Output Impedance vs. Frequency

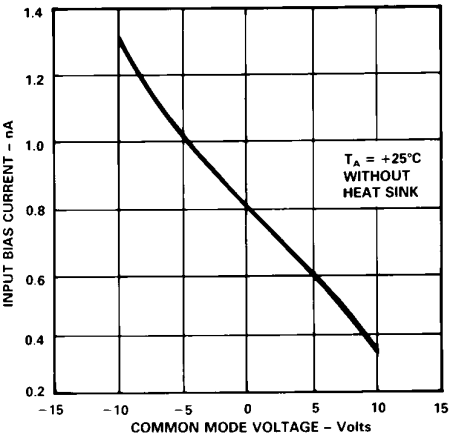


Figure 7. Input Bias Current vs. Common Mode Voltage

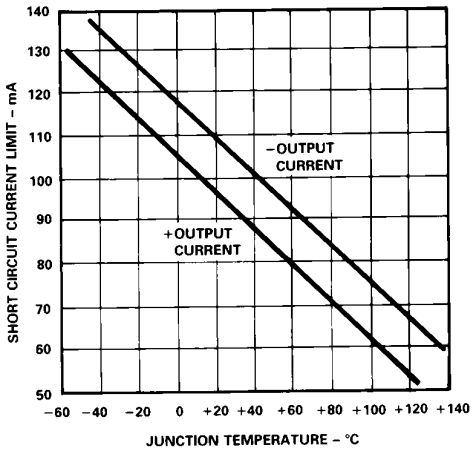


Figure 8. Short Circuit Current Limit vs. Junction Temperature (T_J)

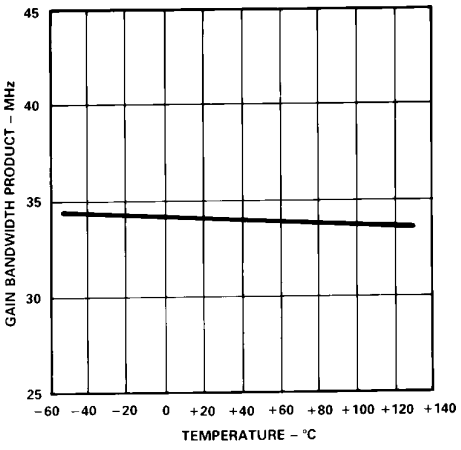


Figure 9. Gain Bandwidth Product vs. Temperature

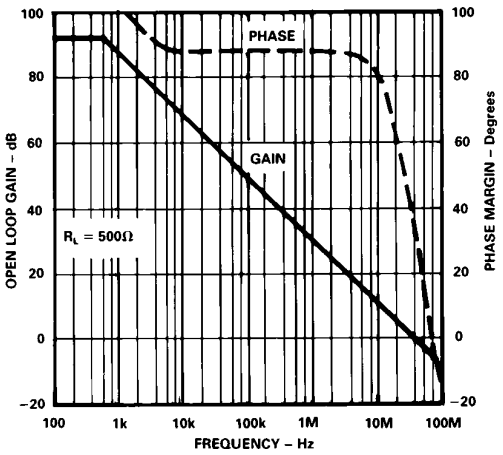


Figure 10. Open Loop Gain and Phase Margin vs. Frequency

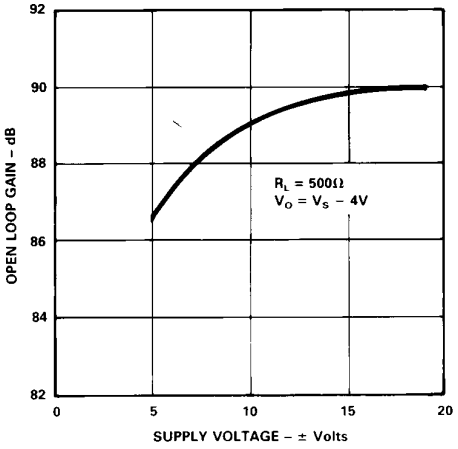


Figure 11. Open Loop Gain vs. Supply Voltage

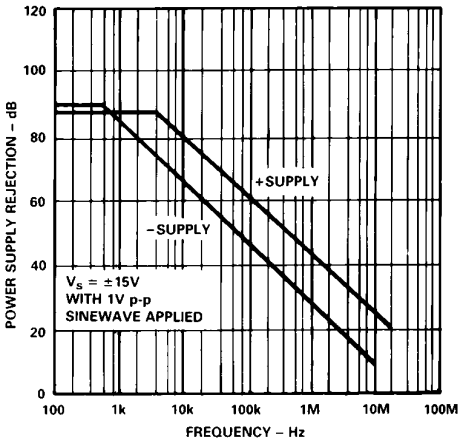


Figure 12. Power Supply Rejection vs. Frequency

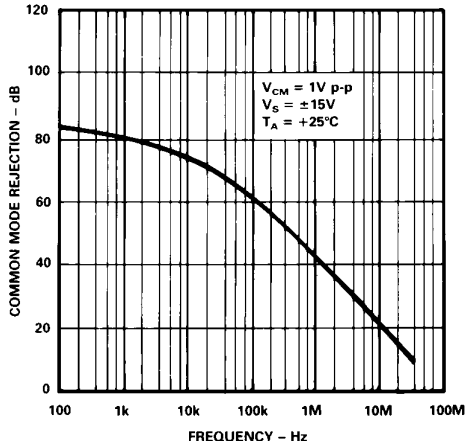


Figure 13. Common Mode Rejection vs. Frequency

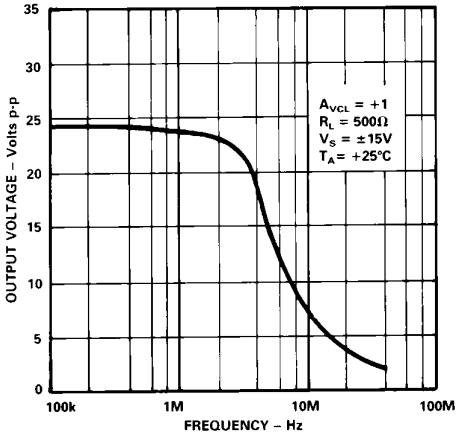


Figure 14. Large Signal Frequency Response

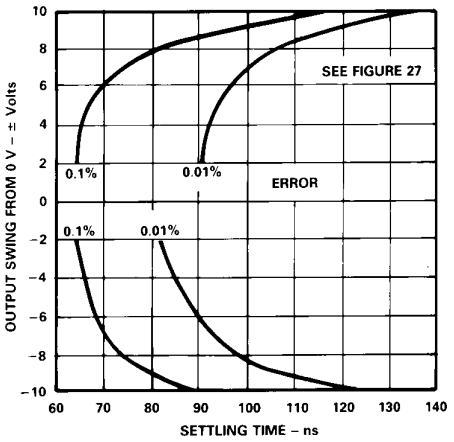


Figure 15. Output Swing and Error vs. Settling Time

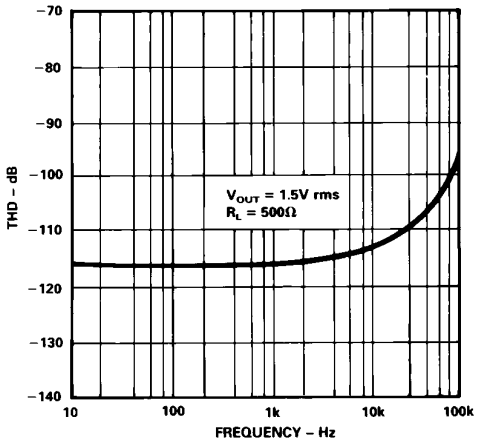


Figure 16. Harmonic Distortion vs. Frequency

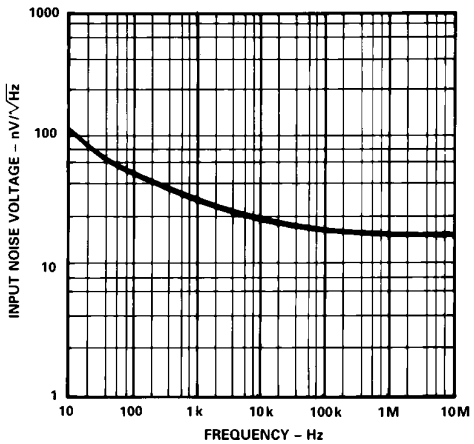


Figure 17. Input Noise Voltage Spectral Density

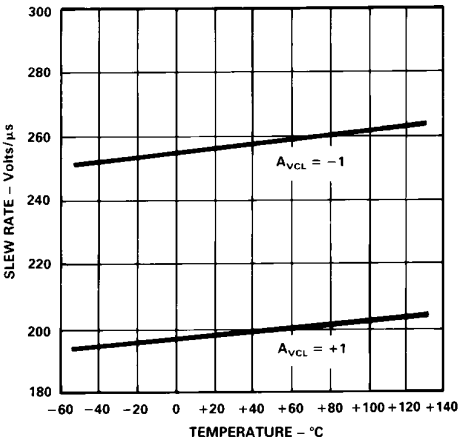


Figure 18. Slew Rate vs. Temperature

AD843–Typical Characteristics

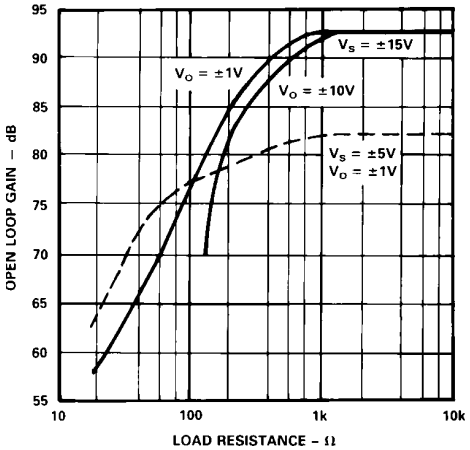


Figure 19. Open Loop Gain vs. Resistive Load

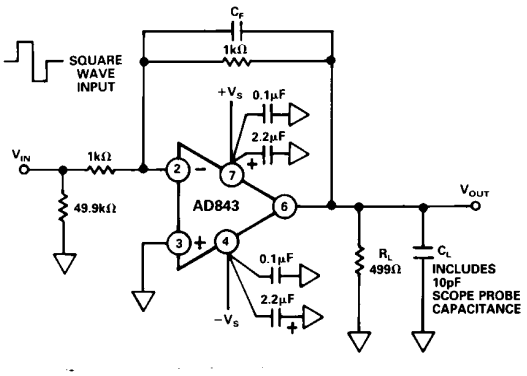


Figure 20a. Inverting Amplifier Connection

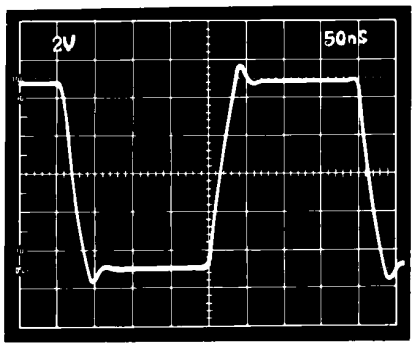


Figure 20b. Inverter Large Signal Pulse Response. C_F = 0, C_L = 10 pF

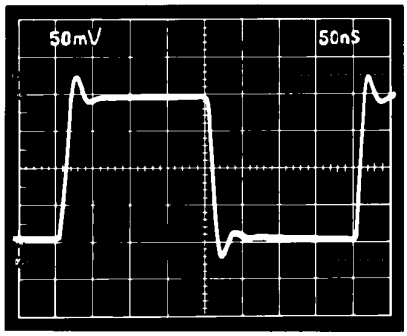


Figure 20c. Inverter Small Signal Pulse Response. C_F = 0, C_L = 10 pF

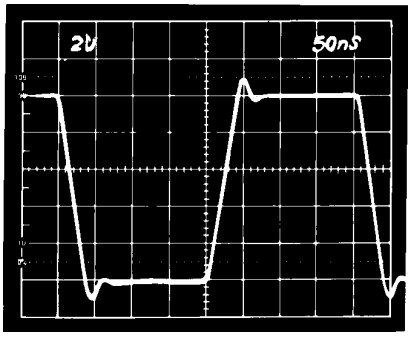


Figure 20d. Inverter Large Signal Pulse Response. C_F = 5 pF, C_L = 110 pF

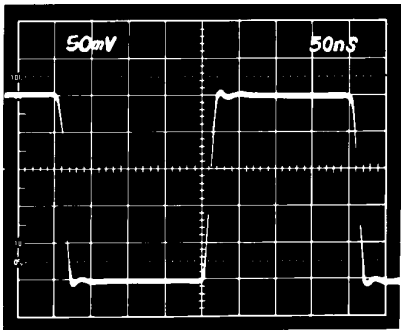


Figure 20e. Inverter Small Signal Pulse Response. C_F = 5 pF, C_L = 110 pF

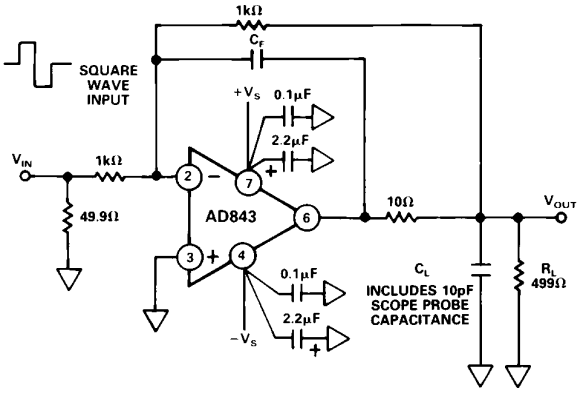


Figure 21a. Unity Gain Inverter Circuit for Driving Capacitive Loads

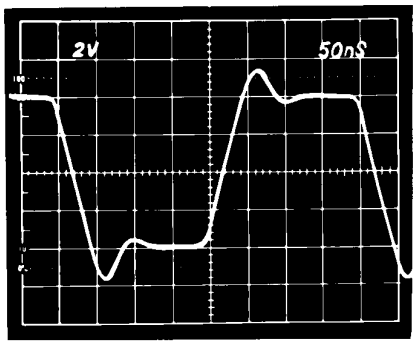


Figure 21b. Inserter Cap Load Large Signal Pulse Response. C_F = 15 pF, C_L = 410 pF

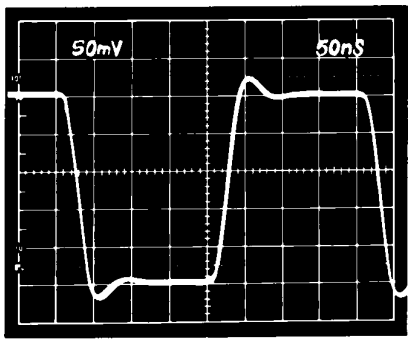


Figure 21c. Inverter Cap Load Small Signal Pulse Response. C_F = 15 pF, C_L = 410 pF

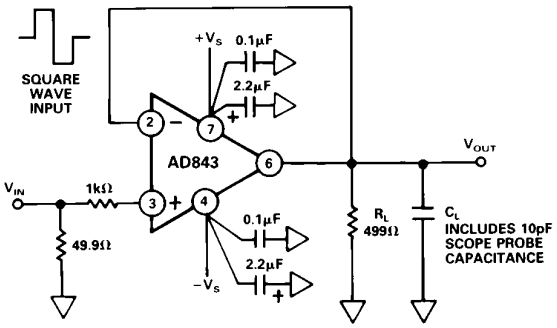


Figure 22a. Unity Gain Buffer Amplifier

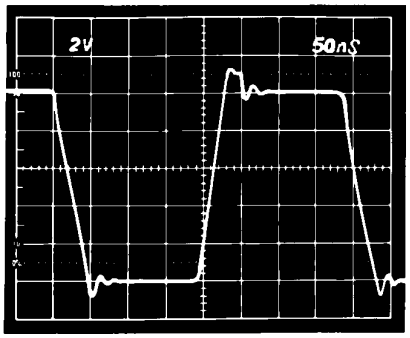


Figure 22b. Buffer Large Signal Pulse Response. C_L = 10 pF

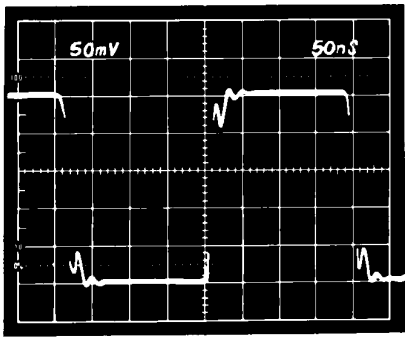


Figure 22c. Buffer Small Signal Pulse Response. C_L = 10 pF

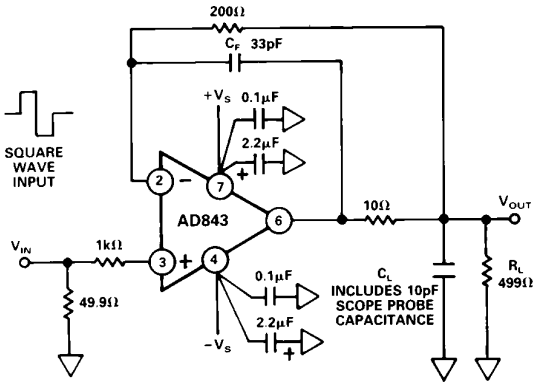


Figure 23a. Unity Gain Buffer Circuit for Driving Capacitive Loads

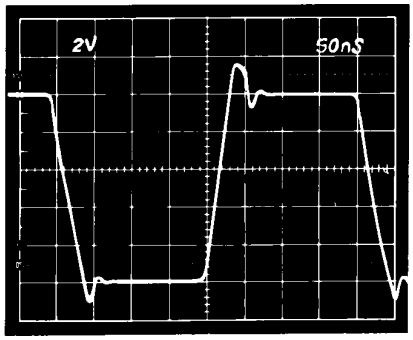


Figure 23b. Buffer Cap Load Large Signal Pulse Response. C_F = 33 pF, C_L = 10 pF

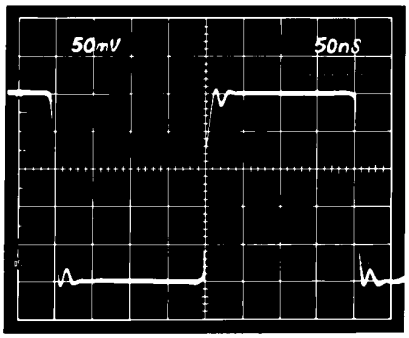


Figure 23c. Buffer Cap Load Small Signal Pulse Response. C_F = 33 pF, C_L = 10 pF

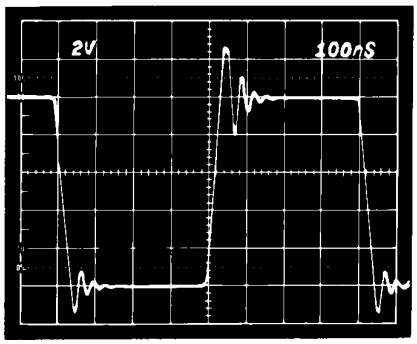


Figure 23d. Buffer Cap Load Large Signal Pulse Response. C_F = 33 pF, C_L = 110 pF

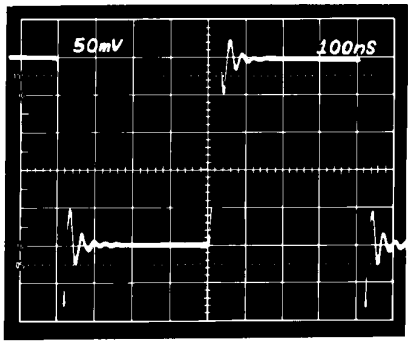


Figure 23e. Buffer Cap Load Small Signal Pulse Response. C_F = 33 pF, C_L = 110 pF