ANALOG DEVICES

Low Power Video Op Amp with Disable

AD810

FEATURES

High Speed
- 80 MHz Bandwidth (3 dB, G = +1)
- 75 MHz Bandwidth (3 dB, G = +2)
- 1000 V/µs Slew Rate
- 50 ns Settling Time to 0.1% (V_O = 10 V Step)

Ideal for Video Applications
- 30 MHz Bandwidth (0.1 dB, G = +2)
- 0.02% Differential Gain
- 0.04° Differential Phase

Low Noise
- 2.9 nV/√Hz Input Voltage Noise
- 13 pA/√Hz Inverting Input Current Noise

Low Power
- 8.0 mA Supply Current max
- 2.1 mA Supply Current (Power-Down Mode)

High Performance Disable Function
- Turn-Off Time 100 ns
- Break Before Make Guaranteed
- Input to Output Isolation of 64 dB (OFF State)

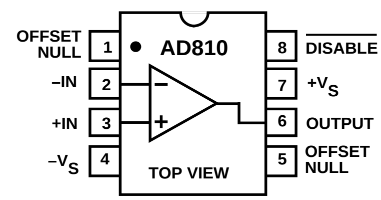
Flexible Operation
- Specified for ±5 V and ±15 V Operation
- ±2.9 V Output Swing Into a 150 Ω Load (V_S = ±5 V)

APPLICATIONS

- Professional Video Cameras
- Multimedia Systems
- NTSC, PAL & SECAM Compatible Systems
- Video Line Driver
- ADC/DAC Buffer
- DC Restoration Circuits

CONNECTION DIAGRAM

8-Pin Plastic Mini-DIP (N), SOIC (R) and Cerdip (Q) Packages

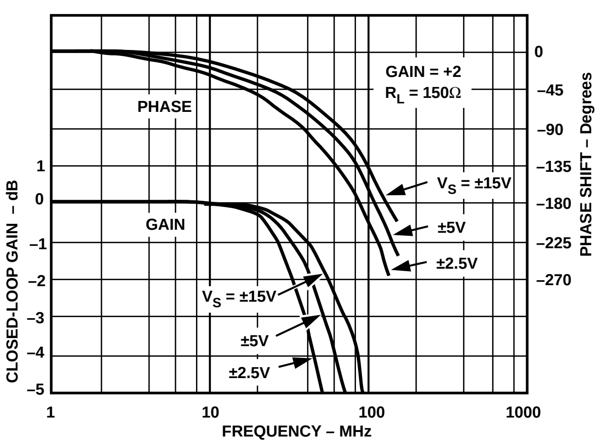


PRODUCT DESCRIPTION

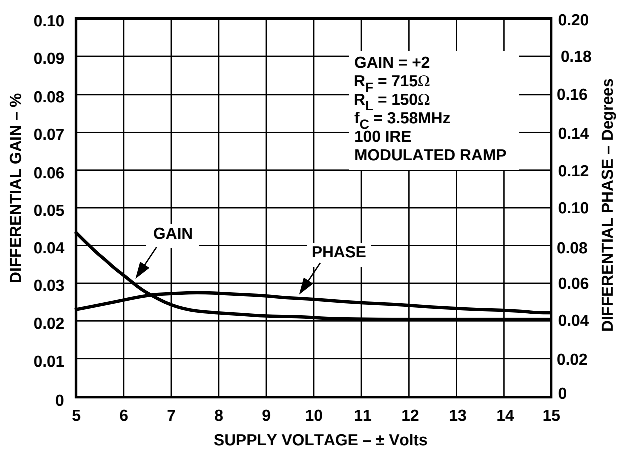
The AD810 is a composite and HDTV compatible, current feedback, video operational amplifier, ideal for use in systems such as multimedia, digital tape recorders and video cameras. The 0.1 dB flatness specification at bandwidth of 30 MHz (G = +2) and the differential gain and phase of 0.02% and 0.04° (NTSC) make the AD810 ideal for any broadcast quality video system. All these specifications are under load conditions of 150 Ω (one 75 Ω back terminated cable).

The AD810 is ideal for power sensitive applications such as video cameras, offering a low power supply current of 8.0 mA max. The disable feature reduces the power supply current to only 2.1 mA, while the amplifier is not in use, to conserve power. Furthermore the AD810 is specified over a power supply range of ±5 V to ±15 V.

The AD810 works well as an ADC or DAC buffer in video systems due to its unity gain bandwidth of 80 MHz. Because the AD810 is a transimpedance amplifier, this bandwidth can be maintained over a wide range of gains while featuring a low noise of 2.9 nV/√Hz for wide dynamic range applications.



Closed-Loop Gain and Phase vs. Frequency, G = +2, R_L = 150, R_F = 715 Ω



Differential Gain and Phase vs. Supply Voltage

REV. A

AD810–SPECIFICATIONS (@ T_A = +25°C and V_S = ±15 V dc, R_L = 150 Ω unless otherwise noted)

Parameter	Conditions	V_S	AD810A Min	AD810A Typ	AD810A Max	AD810S[1] Min	AD810S[1] Typ	AD810S[1] Max	Units
DYNAMIC PERFORMANCE									
3 dB Bandwidth	(G = +2) R_{FB} = 715	±5 V	40	50		40	50		MHz
	(G = +2) R_{FB} = 715	±15 V	55	75		55	75		MHz
	(G = +1) R_{FB} = 1000	±15 V	40	80		40	80		MHz
	(G = +10) R_{FB} = 270	±15 V	50	65		50	65		MHz
0.1 dB Bandwidth	(G = +2) R_{FB} = 715	±5 V	13	22		13	22		MHz
	(G = +2) R_{FB} = 715	±15 V	15	30		15	30		MHz
Full Power Bandwidth	V_O = 20 V p-p,								
	R_L = 400 Ω	±15 V		16			16		MHz
Slew Rate[2]	R_L = 150 Ω	±5 V		350			350		V/µs
	R_L = 400 Ω	±15 V		1000			1000		V/µs
Settling Time to 0.1%	10 V Step, G = –1	±15 V		50			50		ns
Settling Time to 0.01%	10 V Step, G = –1	±15 V		125			125		ns
Differential Gain	f = 3.58 MHz	±15 V		0.02	0.05		0.02	0.05	%
	f - 3.58 MHz	±5 V		0.04	0.07		0.04	0.07	%
Differential Phase	f = 3.58 MHz	±15 V		0.04	0.07		0.04	0.07	Degrees
	f = 3.58 MHz	±5 V		0.045	0.08		0.045	0.08	Degrees
Total Harmonic Distortion	f = 10 MHz, V_O = 2 V p-p								
	R_L = 400 Ω, G = +2	±15 V		–61			–61		dBc
INPUT OFFSET VOLTAGE		±5 V, ±15 V		1.5	6		1.5	6	mV
	T_{MIN}–T_{MAX}	±5 V, ±15 V		2	7.5		4	15	mV
Offset Voltage Drift				7			15		µV/°C
INPUT BIAS CURRENT									
–Input	T_{MIN}–T_{MAX}	±5 V, ±15 V		0.7	5		0.8	5	µA
+Input	T_{MIN}–T_{MAX}	±5 V, ±15 V		2	7.5		2	10	µA
OPEN-LOOP	T_{MIN}–T_{MAX}								
TRANSRESISTANCE	V_O = ±10 V, R_L = 400 Ω	±15 V	1.0	3.5		1.0	3.5		MΩ
	V_O = ±2.5 V, R_L = 100 Ω	±5 V	0.3	1.2		0.2	1.0		MΩ
OPEN-LOOP	T_{MIN}–T_{MAX}								
DC VOLTAGE GAIN	V_O = ±10 V, R_L = 400 Ω	±15 V	86	100		80	100		dB
	V_O = ±2.5 V, R_L = 100 Ω	±5 V	76	88		72	88		dB
COMMON-MODE REJECTION	T_{MIN}–T_{MAX}								
V_{OS}	V_{CM} = ±12 V	±15 V	56	64		56	64		dB
	V_{CM} = ±2.5 V	±5 V	52	60		50	60		dB
±Input Current	T_{MIN}–T_{MAX}	±5 V, ±15 V		0.1	0.4		0.1	0.4	µA/V
POWER SUPPLY REJECTION		±4.5 V to ±18 V							
V_{OS}	T_{MIN}–T_{MAX}		65	72		60	72		dB
±Input Current	T_{MIN}–T_{MAX}			0.05	0.3		0.05	0.3	µA/V
INPUT VOLTAGE NOISE	f = 1 kHz	±5 V, ±15 V		2.9			2.9		$nV/\sqrt{Hz}$
INPUT CURRENT NOISE	$–I_{IN}$, f = 1 kHz	±5 V, ±15 V		13			13		$pA/\sqrt{Hz}$
	$+I_{IN}$, f = 1 kHz	±5 V, ±15 V		1.5			1.5		$pA/\sqrt{Hz}$
INPUT COMMON-MODE		±5 V	±2.5	±3.0		±2.5	±3		V
VOLTAGE RANGE		±15 V	±12	±13		±12	±13		V
OUTPUT CHARACTERISTICS									
Output Voltage Swing[3]	R_L = 150 Ω, T_{MIN}–T_{MAX}	±5 V	±2.5	±2.9		±2.5	±2.9		V
	R_L = 400 Ω	±15 V	±12.5	±12.9		±12.5	±12.9		V
	R_L = 400 Ω, T_{MIN}–T_{MAX}	±15 V	±12			±12			V
Short-Circuit Current		±15 V		150			150		mA
Output Current	T_{MIN}–T_{MAX}	±5 V, ±15 V	40	60		30	60		mA
OUTPUT RESISTANCE	Open Loop (5 MHz)			15			15		Ω
INPUT CHARACTERISTICS									
Input Resistance	+Input	±15 V	2.5	10		2.5	10		MΩ
	–Input	±15 V		40			40		Ω
Input Capacitance	+Input	±15 V		2			2		pF
DISABLE CHARACTERISTICS[4]									
OFF Isolation	f = 5 MHz, See Figure 43			64			64		dB
OFF Output Impedance	See Figure 43			$(R_F + R_G)\|13$ pF			$(R_F + R_G)\|13$ pF		

Parameter	Conditions	V_S	AD810A Min	Typ	Max	AD810S[1] Min	Typ	Max	Units
Turn On Time[5]	Z_{OUT} = Low, See Figure 54			170			170		ns
Turn Off Time	Z_{OUT} = High			100			100		ns
Disable Pin Current	Disable Pin = 0 V	±5 V		50	75		50	75	µA
		±15 V		290	400		290	400	µA
Min Disable Pin Current to Disable	T_{MIN}–T_{MAX}	±5 V, ±15 V		30			30		µA
POWER SUPPLY									
Operating Range	+25°C to T_{MAX}		±2.5		±18	±2.5		±18	V
	T_{MIN}		±3.0		±18	±3.5		±18	V
Quiescent Current		±5 V		6.7	7.5		6.7	7.5	mA
		±15 V		6.8	8.0		6.8	8.0	mA
	T_{MIN}–T_{MAX}	±5 V, ±15 V		8.3	10.0		9	11.0	mA
Power-Down Current		±5 V		1.8	2.3		1.8	2.3	mA
		±15 V		2.1	2.8		2.1	2.8	mA

NOTES
[1]See Analog Devices Military Data Sheet for 883B Specifications.
[2]Slew rate measurement is based on 10% to 90% rise time with the amplifier configured for a gain of –10.
[3]Voltage Swing is defined as useful operating range, not the saturation range.
[4]Disable guaranteed break before make.
[5]Turn On Time is defined with ±5 V supplies using complementary output CMOS to drive the disable pin.

Specifications subject to change without notice.

ABSOLUTE MAXIMUM RATINGS[1]

Supply Voltage . . . . ±18 V
Internal Power Dissipation[2] . . . . Observe Derating Curves
Output Short Circuit Duration . . . . Observe Derating Curves
Common-Mode Input Voltage . . . . ±V_S
Differential Input Voltage . . . . ±6 V
Storage Temperature Range
  Plastic DIP . . . . –65°C to +125°C
  Cerdip . . . . –65°C to +150°C
  Small Outline IC . . . . –65°C to +125°C
Operating Temperature Range
  AD810A . . . . –40°C to +85°C
  AD810S . . . . –55°C to +125°C
Lead Temperature Range (Soldering 60 sec) . . . . +300°C

NOTES
[1]Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum raring conditions for extended periods may affect device reliability.
[2]8-Pin Plastic Package: θ_{JA} = 90°C/Watt; 8-Pin Cerdip Package: θ_{JA} = 110°C/Watt; 8-Pin SOIC Package: θ_{JA} = 150°C/Watt.

ESD SUSCEPTIBILITY

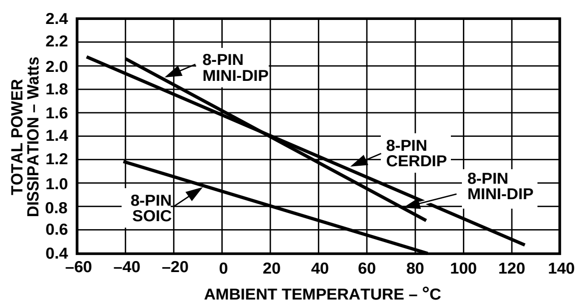
ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 volts, which readily accumulate on the human body and on test equipment, can discharge without detection. Although the AD810 features ESD protection circuitry, permanent damage may still occur on these devices if they are subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid any performance degradation or loss of functionality.

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option
AD810AN	–40°C to +85°C	8-Pin Plastic DIP	N-8
AD810AR	–40°C to +85°C	8-Pin Plastic SOIC	R-8
AD810AR-REEL	–40°C to +85°C	8-Pin Plastic SOIC	R-8
5962-9313201MPA	–55°C to +125°C	8-Pin Cerdip	Q-8

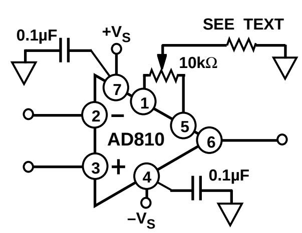
MAXIMUM POWER DISSIPATION

The maximum power that can be safely dissipated by the AD810 is limited by the associated rise in junction temperature. For the plastic packages, the maximum safe junction temperature is 145°C. For the cerdip package, the maximum junction temperature is 175°C. If these maximums are exceeded momentarily, proper circuit operation will be restored as soon as the die temperature is reduced. Leaving the device in the "overheated" condition for an extended period can result in device burnout. To ensure proper operation, it is important to observe the derating curves.



Maximum Power Dissipation vs. Temperature

While the AD810 is internally short circuit protected, this may not be sufficient to guarantee that the maximum junction temperature is not exceeded under all conditions.

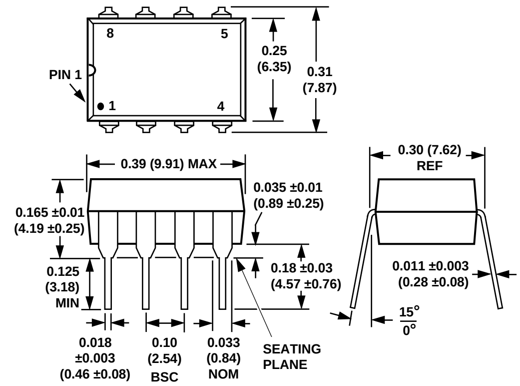


Offset Null Configuration

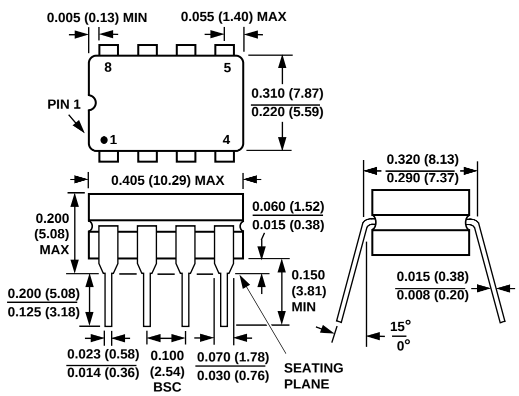
OUTLINE DIMENSIONS

Dimensions shown in inches and (mm).

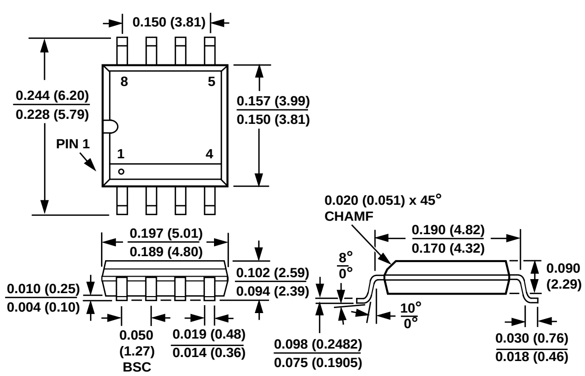
Plastic Mini-DIP (N) Package



Cerdip (Q) Package



8-Pin SOIC (R) Package



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