Low Power Video Op Amp with Disable

Enhanced Product

AD810-EP

FEATURES

High speed
- 80 MHz typical −3 dB bandwidth (G = +1)
- 1000 V/µs typical slew rate

Ideal for video applications
- 30 MHz typical 0.1 dB bandwidth (G = +2, V_S = ±15 V)
- 0.02% typical differential gain (V_S = ±15 V)
- 0.04° typical differential phase (V_S = ±15 V)

Low noise
- 2.9 nV/√Hz typical input voltage noise
- 13 pA/√Hz typical inverting input current noise

Low power
- 8.0 mA maximum supply current (quiescent)
- 2.1 mA typical supply current (power-down mode)

High performance disable function
- Turn off time: 100 ns typical
- Break before make guaranteed
- Input to output isolation of 64 dB (off state)

Specified for ±5 V and ±15 V operation

ENHANCED PRODUCT FEATURES

Supports defense and aerospace applications (AQEC standard)
Military temperature range (−55°C to +125°C)
Controlled manufacturing baseline
1 assembly/test site
1 fabrication site
Product change notification
Qualification data available on request

APPLICATIONS

Multimedia systems
ADC or DAC buffers
Avionics
Missiles and munitions

CONNECTION DIAGRAM

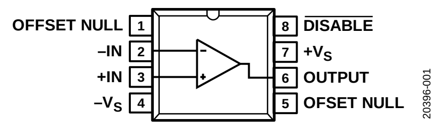

Figure 1.

GENERAL DESCRIPTION

The AD810-EP 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 a bandwidth of 30 MHz (G = +2) and the differential gain and phase of 0.02% and 0.04° (NTSC) make the AD810-EP 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-EP is ideal for power sensitive applications such as video cameras, offering a low power supply current of 8.0 mA maximum. 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-EP is specified over a power supply range of ±5 V to ±15 V.

The AD810-EP works well as an ADC or DAC buffer in video systems due to its unity gain (G = +1) −3 dB bandwidth of 80 MHz. Because the AD810-EP 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.

Additional application and technical information can be found in the AD810 data sheet.

Rev. 0 Document Feedback

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Technical Support **www.analog.com**

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REVISION HISTORY

5/2019—Revision 0: Initial Version

SPECIFICATIONS

T_A = 25°C, supply voltage (V_S) = ±15 V dc, load resistance (R_L) = 150 Ω, unless otherwise noted.

Table 1.

Parameter	Test Conditions/Comments	Min	Typ	Max	Unit
DYNAMIC PERFORMANCE					
−3 dB Bandwidth	G = +2, feedback resistor (R_F) = 715 Ω, V_S = ±5 V	40	50		MHz
	G = +2, R_F = 715 Ω, V_S = ±15 V	55	75		MHz
	G = +1, R_F = 1000 Ω, V_S = ±15 V	40	80		MHz
	G = +10, R_F = 270 Ω, V_S = ±15 V	50	65		MHz
0.1 dB Bandwidth	G = +2, R_F = 715 Ω, V_S = ±5 V	13	22		MHz
	G = +2, R_F = 715 Ω, V_S = ±15 V	15	30		MHz
Full Power Bandwidth	Output voltage (V_{OUT}) = 20 V p-p				
	R_L = 400 Ω	8	16		MHz
Slew Rate[1]	R_L = 150 Ω, V_S = ±5 V	175	350		V/μs
	R_L = 400 Ω, V_S = ±15 V	500	1000		V/μs
Settling Time to 0.1%	10 V step, G = −1		50		ns
Settling Time to 0.01%	10 V step, G = −1		125		ns
Differential Gain	f = 3.58 MHz, V_S = ±15 V		0.02	0.05	%
	f = 3.58 MHz, V_S = ±5 V		0.04	0.07	%
Differential Phase	f = 3.58 MHz, V_S = ±15 V		0.04	0.07	Degrees
	f = 3.58 MHz, V_S = ±5 V		0.045	0.08	Degrees
Total Harmonic Distortion	f = 10 MHz, V_{OUT} = 2 V p-p				
	R_L = 400 Ω, G = +2		−61		dBc
INPUT OFFSET VOLTAGE	V_S = ±5 V and ±15 V		1.5	6	mV
	T_{MIN} to T_{MAX}, V_S = ±5 V and ±15 V		4	15	mV
Offset Voltage Drift			15		μV/°C
INPUT BIAS CURRENT					
Negative Input	T_{MIN} to T_{MAX}, V_S = ±5 V and ±15 V		0.8	5	μA
Positive Input	T_{MIN} to T_{MAX}, V_S = ±5 V and ±15 V		2	10	μA
OPEN-LOOP TRANSRESISTANCE	T_{MIN} to T_{MAX}				
	V_{OUT} = ±10 V, R_L = 400 Ω, V_S = ±15 V	1.0	3.5		MΩ
	V_{OUT} = ±2.5 V, R_L = 100 Ω, V_S = ±5 V	0.2	1.0		MΩ
OPEN-LOOP DC VOLTAGE GAIN	T_{MIN} to T_{MAX}				
	V_{OUT} = ±10 V, R_L = 400 Ω, V_S = ±15 V	80	100		dB
	V_{OUT} = ±2.5 V, R_L = 100 Ω, V_S = ±5 V	72	88		dB
COMMON-MODE REJECTION	T_{MIN} to T_{MAX}				
Offset Voltage (V_{OS})	Common-mode voltage (V_{CM}) = ±12 V, V_S = ±15 V	56	64		dB
	V_{CM} = ±2.5 V, V_S = ±5 V	50	60		dB
Input Bias Current	T_{MIN} to T_{MAX}, V_S = ±5 V and ±15 V	−0.4	0.1	+0.4	μA/V
POWER SUPPLY REJECTION					
V_{OS}	T_{MIN} to T_{MAX}, V_S = ±4.5 V to ±18 V	60	72		dB
Input Bias Current	T_{MIN} to T_{MAX}	−0.3	0.05	+0.3	μA/V
INPUT VOLTAGE NOISE	f = 1 kHz, V_S = ±5 V and ±15 V		2.9		nV/√Hz
INPUT CURRENT NOISE	Negative input current ($-I_{IN}$), f = 1 kHz, V_S = ±5 V and ±15 V		13		pA/√Hz
	Positive input current ($+I_{IN}$), f = 1 kHz, V_S = ±5 V and ±15 V		1.5		pA/√Hz
INPUT COMMON-MODE VOLTAGE RANGE	V_S = ±5 V	±2.5	±3.0		V
	V_S = ±15 V	±12	±13		V

Parameter	Test Conditions/Comments	Min	Typ	Max	Unit
OUTPUT CHARACTERISTICS					
Output Voltage Swing[2]	R_L = 150 Ω, T_{MIN} to T_{MAX}, V_S = ±5 V	±2.5	±2.9		V
	R_L = 400 Ω, V_S = ±15 V	±12.5	±12.9		V
	R_L = 400 Ω, T_{MIN} to T_{MAX}, V_S = ±15 V	±12			V
Short-Circuit Current			150		mA
Output Current	T_{MIN} to T_{MAX}, V_S = ±5 V and ±15 V	30	60		mA
OUTPUT RESISTANCE	Open loop (5 MHz)		15		Ω
INPUT CHARACTERISTICS					
Input Resistance	Positive input	2.5	10		MΩ
	Negative input		40		Ω
Input Capacitance	Positive input		2		pF
DISABLE CHARACTERISTICS[3]					
Off Isolation	f = 5 MHz		64		dB
Off Output Resistance	R_G is gain resistor		(R_F + R_G)‖13 pF		Ω
Turn On Time[4]	Output impedance (Z_{OUT}) = low		170		ns
Turn Off Time	Z_{OUT} = high		100		ns
$\overline{\text{DISABLE}}$ Pin Current	$\overline{\text{DISABLE}}$ pin = 0 V, V_S = ±5 V		50	75	μA
	$\overline{\text{DISABLE}}$ pin = 0 V, V_S = ±15 V		290	400	μA
Minimum $\overline{\text{DISABLE}}$ Pin Current to Disable	T_{MIN} to T_{MAX}, V_S = ±5 V and ±15 V	10	30	40	μA
POWER SUPPLY					
Operating Range	25°C to T_{MAX}	±2.5		±18	V
	T_{MIN}	±3.5		±18	V
Quiescent Current	V_S = ±5 V		6.7	7.5	mA
	V_S = ±15 V		6.8	8.0	mA
	T_{MIN} to T_{MAX}, V_S = ±5 V and ±15 V		9	11.0	mA
Power-Down Current	V_S = ±5 V		1.8	2.3	mA
	V_S = ±15 V		2.1	2.8	mA
TEMPERATURE					
Operating Range (T_{MIN} to T_{MAX})		−55		+125	°C

[1] Slew rate measurement is based on 10% to 90% rise time with the amplifier configured for a gain of −10.
[2] Voltage swing is defined as useful operating range, not the saturation range.
[3] Disable guaranteed break before make. Refer to the AD810 data sheet for additional setup details.
[4] Turn on time is defined with ±5 V supplies using complementary output CMOS to drive the disable pin.

ABSOLUTE MAXIMUM RATINGS

Table 2.

Parameter	Rating
Supply Voltage	±18 V
Internal Power Dissipation	See Figure 2
Output Short-Circuit Duration[1]	See Figure 2
Common-Mode Input Voltage	$\pm V_S$
Differential Input Voltage	±6 V
Storage Temperature Range	−65°C to +150°C
Operating Temperature Range	−55°C to +125°C
Junction Temperature	145°C
Lead Temperature Range (Soldering 60 sec)	300°C

[1] Internal short-circuit protection may not be sufficient to guarantee that the maximum junction temperature is not exceeded under all conditions.

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.

Table 3. Thermal Resistance

Package Type	θ_{JA}	Unit
R-8	150	°C/W

MAXIMUM POWER DISSIPATION

The maximum power that can be safely dissipated by the AD810 is limited by the associated rise in junction temperature. To ensure proper operation, it is important to observe the derating curves in Figure 2.

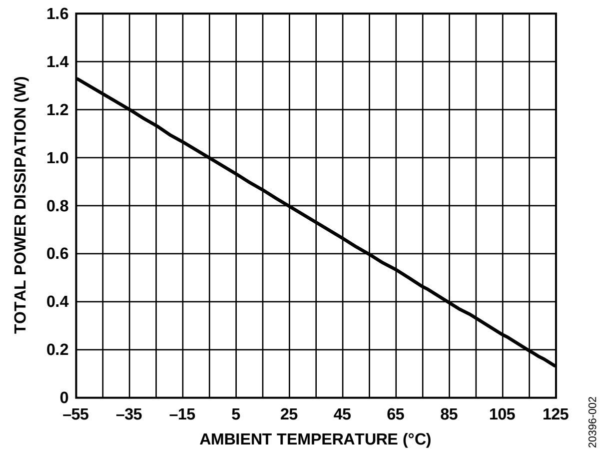
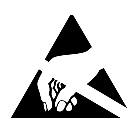


Figure 2. Total Power Dissipation vs. Ambient Temperature

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

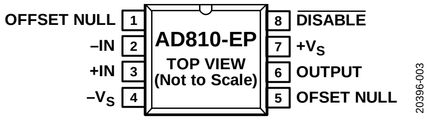


Figure 3. Pin Configuration

Table 4. Pin Function Descriptions

Pin No.	Mnemonic	Description
1, 5	OFFSET NULL	Inverting Input Offset Null Connection.
2	−IN	Inverting Input.
3	+IN	Noninverting Input.
4	$-V_S$	Negative Supply Voltage.
6	OUTPUT	Output.
7	$+V_S$	Positive Supply Voltage.
8	$\overline{\text{DISABLE}}$	Disable (Active Low).

TYPICAL PERFORMANCE CHARACTERISTICS

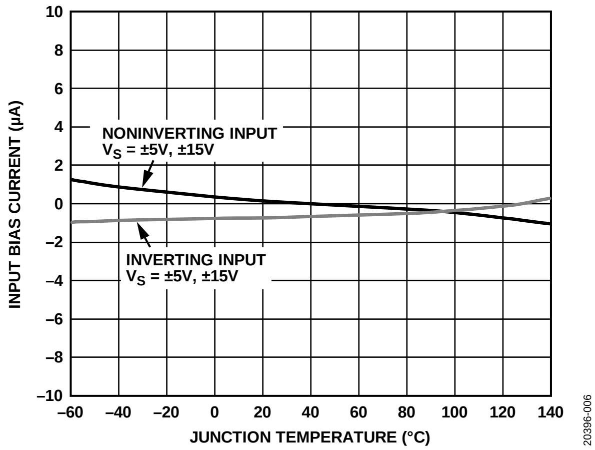


Figure 4. Input Bias Current vs. Junction Temperature

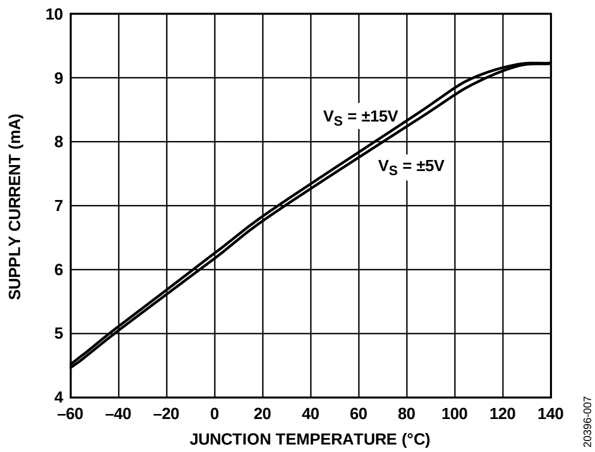


Figure 5. Supply Current vs. Junction Temperature

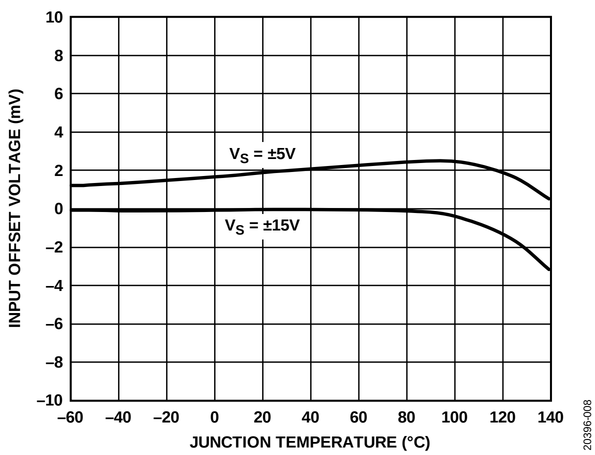


Figure 6. Input Offset Voltage vs. Junction Temperature

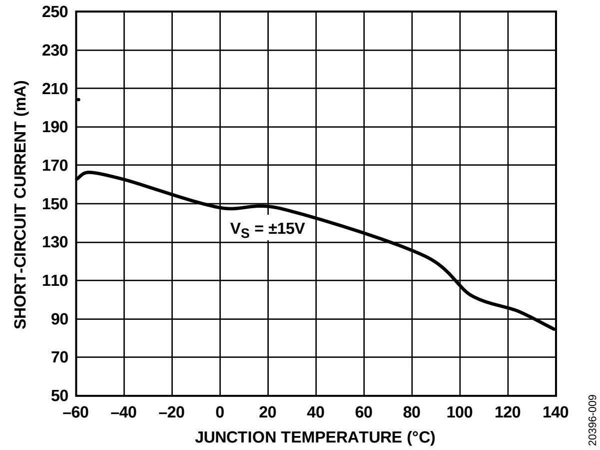


Figure 7. Short-Circuit Current vs. Junction Temperature

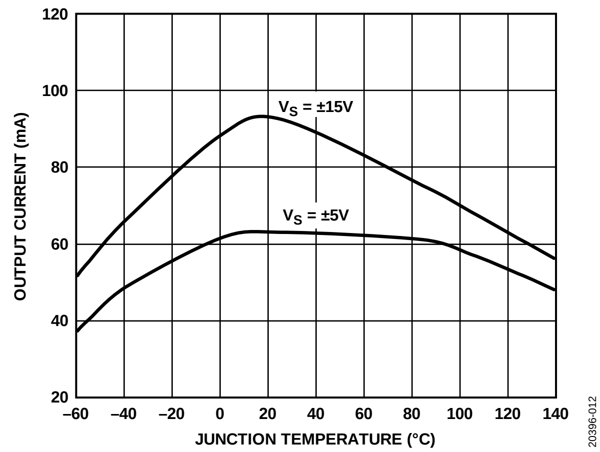


Figure 8. Output Current vs. Junction Temperature

OUTLINE DIMENSIONS

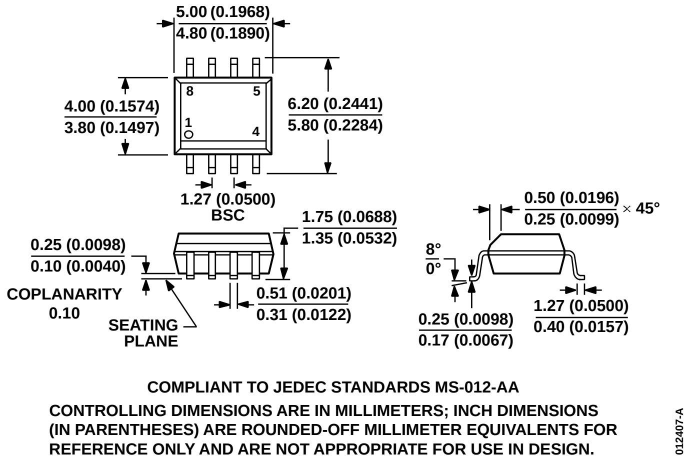


Figure 9. 8-Lead Standard Small Outline Package [SOIC_N]
Narrow Body
(R-8)
Dimensions shown in millimeters and (inches)

ORDERING GUIDE

Model[1]	Temperature Range	Package Description	Package Option
AD810TRZ-EP	−55°C to +125°C	8-Lead Standard Small Outline Package [SOIC_N]	R-8
AD810TRZ-EP-RL	−55°C to +125°C	8-Lead Standard Small Outline Package [SOIC_N]	R-8

[1] Z = RoHS Compliant Part.

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