Low Power, Low Noise Precision FET Op Amp

AD795

FEATURES

Low Power Replacement for Burr-Brown OPA-111, OPA-121 Op Amps
Low Noise
- **2.5 μV p-p max, 0.1 Hz to 10 Hz**
- **11 nV/√Hz max at 10 kHz**
- **0.6 fA/√Hz at 1 kHz**

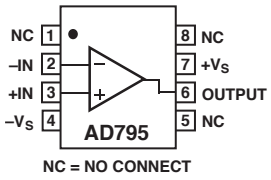
High DC Accuracy
- **250 μV max Offset Voltage**
- **3 μV/°C max Drift**
- **1 pA max Input Bias Current**
- **Low Power: 1.5 mA max Supply Current**

APPLICATIONS

Low Noise Photodiode Preamps
CT Scanners
Precision I-to-V Converters

CONNECTION DIAGRAMS

8-Pin SOIC (RN) Package



PRODUCT DESCRIPTION

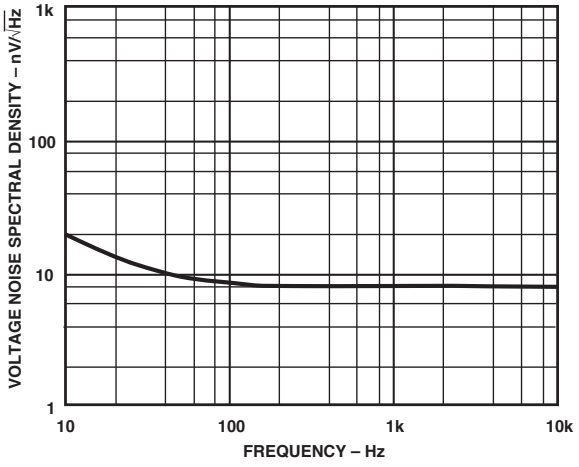
The AD795 is a low noise, precision, FET input operational amplifier. It offers both the low voltage noise and low offset drift of a bipolar input op amp and the very low bias current of a FET-input device. The 10^{14} Ω common-mode impedance insures that input bias current is essentially independent of common-mode voltage and supply voltage variations.

The AD795 has both excellent dc performance and a guaranteed and tested maximum input voltage noise. It features 1 pA maximum input bias current and 250 μV maximum offset voltage, along with low supply current of 1.5 mA max.

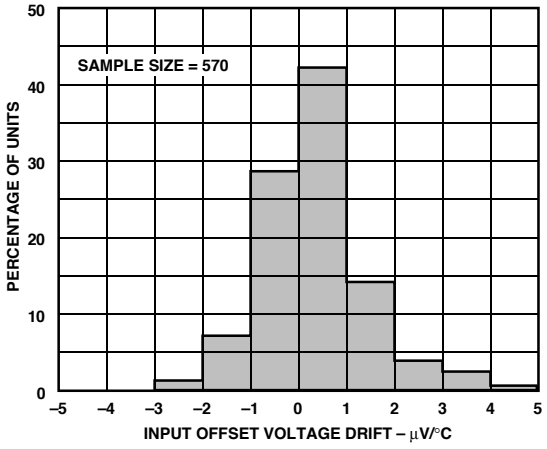
Furthermore, the AD795 features a guaranteed low input noise of 2.5 μV p-p (0.1 Hz to 10 Hz) and a 11 nV/√Hz max noise level at 10 kHz. The AD795 has a fully specified and tested input offset voltage drift of only 3 μV/°C max.

The AD795 is useful for many high input impedance, low noise applications. The AD795J and AD795K are rated over the commercial temperature range of 0°C to +70°C.

The AD795 is available in 8-pin SOIC.



AD795 Voltage Noise Spectral Density



Typical Distribution of Average Input Offset Voltage Drift

AD795–SPECIFICATIONS (@ +25°C and ±15 V dc unless otherwise noted)

Parameter	Conditions	AD795JR Min	AD795JR Typ	AD795JR Max	Units
INPUT OFFSET VOLTAGE[1]					
Initial Offset			100	500	µV
Offset	T_{MIN}–T_{MAX}		300	1000	µV
vs. Temperature			3	10	µV/°C
vs. Supply (PSRR)		86	110		dB
vs. Supply (PSRR)	T_{MIN}–T_{MAX}	84	100		dB
INPUT BIAS CURRENT [2]					
Either Input	V_{CM} = 0 V		1	2/3	pA
Either Input @ T_{MAX} =	V_{CM} = 0 V		23		pA
Either Input	V_{CM} = +10 V		1		pA
Offset Current	V_{CM} = 0 V		0.1	1.0	pA
Offset Current @ T_{MAX} =	V_{CM} = 0 V		2		pA
OPEN-LOOP GAIN	V_O = ±10 V				
	R_{LOAD} ≥ 10 kΩ	110	120		dB
	R_{LOAD} ≥ 10 kΩ	100	108		dB
INPUT VOLTAGE NOISE	0.1 Hz to 10 Hz		1.0	3.3	µV p-p
	f = 10 Hz		20	50	nV/√Hz
	f = 100 Hz		12	40	nV/√Hz
	f = 1 kHz		11	17	nV/√Hz
	f = 10 kHz		9	11	nV/√Hz
INPUT CURRENT NOISE	f = 0.1 Hz to 10 Hz		13		fA p-p
	f = 1 kHz		0.6		fA/√Hz
FREQUENCY RESPONSE					
Unity Gain, Small Signal	G = –1		1.6		MHz
Full Power Response	V_O = 20 V p-p				
	R_{LOAD} = 2 kΩ		16		kHz
Slew Rate, Unity Gain	V_{OUT} = 20 V p-p				
	R_{LOAD} = 2 kΩ		1		V/µs
SETTLING TIME[3]					
To 0.1%	10 V Step		10		µs
To 0.01%	10 V Step		11		µs
Overload Recovery[4]	50% Overdrive		2		µs
Total Harmonic	f = 1 kHz				
Distortion	R1 ≥ 10 kΩ				
	V_O = 3 V rms		–108		dB
INPUT IMPEDANCE					
Differential	V_{DIFF} = ±1 V		10^{12}‖2		Ω‖pF
Common Mode			10^{14}‖2.2		Ω‖pF
INPUT VOLTAGE RANGE					
Differential[5]			±20		V
Common-Mode Voltage		±10	±11		V
Over Max Operating Temperature		±10			V
Common-Mode Rejection Ratio	V_{CM} = ±10 V	90	110		dB
	T_{MIN}–T_{MAX}	86	100		dB
OUTPUT CHARACTERISTICS					
Voltage	R_{LOAD} ≥ 2 kΩ	V_S –4	V_S –2.5		V
	T_{MIN}–T_{MAX}	V_S –4			V
Current	V_{OUT} = ±10 V	±5	±10		mA
	Short Circuit		±15		mA
POWER SUPPLY					
Rated Performance			±15		V
Operating Range		±4		±18	V
Quiescent Current			1.3	1.5	mA

NOTES
[1]Input offset voltage specifications are guaranteed after 5 minutes of operation at T_A = +25°C.
[2]Bias current specifications are guaranteed maximum at either input after 5 minutes of operation at T_A = +25°C. For higher temperature, the current doubles every 10°C.
[3]Gain = –1, R1 = 10 kΩ.
[4]Defined as the time required for the amplifier's output to return to normal operation after removal of a 50% overload from the amplifier input.
[5]Defined as the maximum continuous voltage between the inputs such that neither input exceeds ±10 V from ground.

All min and max specifications are guaranteed.
Specifications subject to change without notice.

ABSOLUTE MAXIMUM RATINGS[1]

Supply Voltage . . . . . ±18 V
Internal Power Dissipation[2] (@ T_A = +25°C)
SOIC Package . . . . . 500 mW
Input Voltage . . . . . $\pm V_S$
Output Short Circuit Duration . . . . . Indefinite
Differential Input Voltage . . . . . $+V_S$ and $-V_S$
Storage Temperature Range (R) . . . . . –65°C to +125°C
Operating Temperature Range
AD795J . . . . . 0°C to +70°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 rating conditions for extended periods may affect device reliability.
[2]8-Pin Small Outline Package: θ_{JA} = 155°C/Watt

ORDERING GUIDE

Model	Temperature Range	Package Option*
AD795JR	0°C to +70°C	RN-8

*N = Plastic mini-DIP; R = SOIC package.

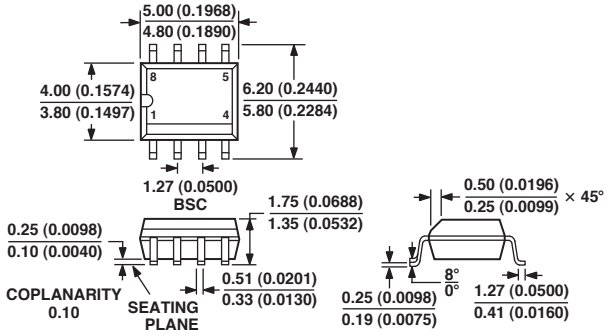
CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the AD795 features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

OUTLINE DIMENSIONS

8-Lead Standard Small Outline Package [SOIC]
Narrow Body
(RN-8)

Dimensions shown in millimeters and (inches)



COMPLIANT TO JEDEC STANDARDS MS-012AA
CONTROLLING DIMENSIONS ARE IN MILLIMETERS; INCH DIMENSIONS
(IN PARENTHESES) ARE ROUNDED-OFF MILLIMETER EQUIVALENTS FOR
REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN