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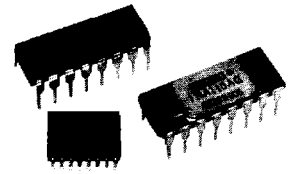


INA110

www.burr-brown.com/databook/INA110.html

Fast-Settling FET-Input INSTRUMENTATION AMPLIFIER

FEATURES

- LOW BIAS CURRENT: 50pA max
- FAST SETTLING: 4µs to 0.01%
- HIGH CMR: 106dB min; 90dB at 10kHz
- INTERNAL GAINS: 1, 10, 100, 200, 500
- VERY LOW GAIN DRIFT: 10 to 50ppm/°C
- LOW OFFSET DRIFT: 2µV/°C
- LOW COST
- PINOUT SIMILAR TO AD524 AND AD624

APPLICATIONS

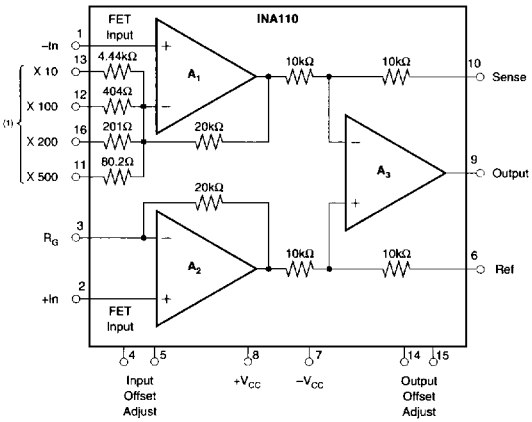
- MULTIPLEXED INPUT DATA ACQUISITION SYSTEM
- FAST DIFFERENTIAL PULSE AMPLIFIER
- HIGH SPEED GAIN BLOCK
- AMPLIFICATION OF HIGH IMPEDANCE SOURCES

DESCRIPTION

The INA110 is a versatile monolithic FET-input instrumentation amplifier. Its current-feedback circuit topology and laser trimmed input stage provide excellent dynamic performance and accuracy. The INA110 settles in 4µs to 0.01%, making it ideal for high speed or multiplexed-input data acquisition systems.

Internal gain-set resistors are provided for gains of 1, 10, 100, 200, and 500V/V. Inputs are protected for differential and common-mode voltages up to $\pm V_{CC}$. Its very high input impedance and low input bias current make the INA110 ideal for applications requiring input filters or input protection circuitry.

The INA110 is available in 16-pin plastic and ceramic DIPs, and in the SOL-16 surface-mount package. Military, industrial and commercial temperature range grades are available.



NOTE: (1) Connect to R_G for desired gain.

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Internet: http://www.burr-brown.com/ • FAXLine: (800) 548-6133 (US/Canada Only) • Cable: BBRCORP • Telex: 066-6491 • FAX: (520) 889-1510 • Immediate Product Info: (800) 548-6132

SPECIFICATIONS

ELECTRICAL

At +25°C, $\pm V_{CC}$ = 15VDC, and R_L = 2kΩ, unless otherwise specified.

PARAMETER	CONDITIONS	INA110AG			INA110BG, SG			INA110KP, KU			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
GAIN											
Range of Gain		1		800	*		*	*		*	V/V
Gain Equation[1]			*			G = 1 + [40k/(R_G + 50Ω)]			*		V/V
Gain Error, DC: G = 1			*0.002*	*0.04*		*	*0.02*		*	*	%
G = 10			0.01	0.1		0.005	0.05		*	*	%
G = 100			0.02	0.2		0.01	0.1		*	*	%
G = 200			0.04	0.4		0.02	0.2		*	*	%
G = 500			0.1	1		0.05	0.5		*	*	%
Gain Temp. Coefficient: G = 1			±3	±20		*	±10		*		ppm/°C
G = 10			±4	±20		±2	±10		*		ppm/°C
G = 100			±6	±40		±3	±20		*		ppm/°C
G = 200			±10	±60		±5	±30		*		ppm/°C
G = 500			±25	±100		±10	±50		*		ppm/°C
Nonlinearity, DC: G = 1			±0.001	±0.01		±0.0005	±0.005		*	*	% of FS
G = 10			±0.002	±0.01		±0.001	±0.005		*	*	% of FS
G = 100			±0.004	±0.02		±0.002	±0.01		*	*	% of FS
G = 200			±0.006	±0.02		±0.003	±0.01		*	*	% of FS
G = 500			±0.01	±0.04		±0.005	±0.02		*	*	% of FS
OUTPUT											
Voltage, R_L = 2kΩ	Over Temperature	±10	±12.7		*	*		*	*		V
Current	Over Temperature	±5	±25		*	*		*	*		mA
Short-Circuit Current			±25			*			*		mA
Capacitive Load	Stability		5000			*			*		pF
INPUT OFFSET VOLTAGE[2]											
Initial Offset: G, P			±(100 + 1000/G)	±(500 + 5000/G)		±(50 + 600/G)	±(250 + 3000/G)		*	*	µV
U									±(200 + 2000/G)	±(1000 + 5000/G)	µV
vs Temperature			±(2 + 20/G)	±(5 + 100/G)		±(1 + 10/G)	±(2 + 50/G)		*		µV/°C
vs Supply	V_{CC} = ±6V to ±18V		±(4 + 60/G)	±(30 + 300/G)		±(2 + 30/G)	±(10 + 180/G)		*	*	µV/V
BIAS CURRENT											
Initial Bias Current	*Each Input*		*20*	*100*		10	50		*	*	pA
Initial Offset Current			2	50		1	25		*	*	pA
Impedance: Differential			$5x10^{12}$||6			*			*		Ω || pF
Common-Mode			$2x10^{12}$||1			*			*		Ω || pF
VOLTAGE RANGE	V_{IN} Diff. = 0V[3]										
Range, Linear Response		±10	±12					*	*		V
CMR with 1kΩ Source Imbalance:											
G = 1	DC	70	90		80	100		*	*		dB
G = 10	DC	87	104		96	112		*	*		dB
G = 100	DC	100	110		106	116		*	*		dB
G = 200	DC	100	110		106	116		*	*		dB
G = 500	DC	100	110		106	116		*	*		dB
INPUT NOISE[4]											
Voltage, f_O = 10kHz			10			*			*		nV/√Hz
f_B = 0.1Hz to 10Hz			1			*			*		µVp-p
Current, f_O = 10kHz			1.8			*			*		fA/√Hz
OUTPUT NOISE[4]											
Voltage, f_O = 10kHz			65			*			*		nV/√Hz
f_B = 0.1Hz to 10Hz			8			*			*		µVp-p
DYNAMIC RESPONSE											
Small Signal: G = 1	–3dB		2.5			*			*		MHz
G = 10			2.5			*			*		MHz
G = 100			470			*			*		kHz
G = 200			240			*			*		kHz
G = 500			100			*			*		kHz
Full Power	V_{OUT} = ±10V,										
	G = 2 to 100	190	270		*	*			*	*	kHz
Slew Rate	G = 2 to 100	12	17		*	*			*	*	V/µs
Settling Time:											
0.1%, G = 1	V_O = 20V Step		4			*			*		µs
G = 10			2			*			*		µs
G = 100			3			*			*		µs
G = 200			5			*			*		µs
G = 500			11			*			*		µs

SPECIFICATIONS (CONT)

ELECTRICAL

At +25°C, $\pm V_{CC}$ 15VDC, and R_L = 2KΩ, unless otherwise specified.

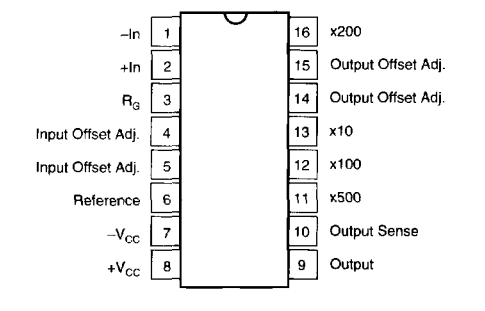
PARAMETER	CONDITIONS	INA110AG			INA110BG, SG			INA110KP, KU			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
DYNAMIC RESPONSE (CONT)											
Settling Time:											
0.01%,G = 1	V_O = 20V Step		5	12.5		*	*		*		µs
G = 10			3	7.5		*	*		*		µs
G = 100			4	7.5		*	*		*		µs
G = 200			7	12.5		*	*		*		µs
G = 500			16	25		*	*		*		µs
Recovery[5]	50% Overdrive		1			*			*		µs
POWER SUPPLY											
Rated Voltage			±15			*			*		V
Voltage Range		±6		±18	*		*	*		*	V
Quiescent Current	V_O = 0V		±3	±4.5		*	*		*	*	mA
TEMPERATURE RANGE											
Specification: A, B, K		–25		+85	*		*	0		+70	°C
S					–55		+125				°C
Operation		–55		+125	*		*	–25		+85	°C
Storage		–65		+150	*		*	–40		+85	°C
θ_{JA}			100			*			*		°C/W

* Same as INA110AG.

NOTES: (1) Gains other than 1, 10, 100, 200, and 500 can be set by adding an external resistor, R_G, between pin 3 and pins 11, 12 and 16. Gain accuracy is a function of R_G and the internal resistors which have a ±20% tolerance with 20ppm/°C drift. (2) Adjustable to zero. (3) For differential input voltage other than zero, see Typical Performance Curves. (4) $V_{NOISE\ RTI} = \sqrt{V_N^2{}_{INPUT} + (V_{N\ OUTPUT}/Gain)^2}$. (5) Time required for output to return from saturation to linear operation following the removal of an input overdrive voltage.

PIN CONFIGURATION

Top View — DIP/SOIC



ABSOLUTE MAXIMUM RATINGS

Supply Voltage	±18V
Input Voltage Range	$\pm V_{CC}$
Operating Temperature Range: G	–55°C to +125°C
P, U	–25°C to +85°C
Storage Temperature Range: G	–65°C to +150°C
P, U	–40°C to +85°C
Lead Temperature (soldering, 10s): G, P	+300°C
(soldering, 3s): U	+260°C
Output Short Circuit Duration	Continuous to Common

PACKAGE/ORDERING INFORMATION

PRODUCT	PACKAGE	PACKAGE DRAWING NUMBER[1]	TEMPERATURE RANGE
INA110AG	16-Pin Ceramic DIP	109	–25°C to +85°C
INA110BG	16-Pin Ceramic DIP	109	–25°C to +85°C
INA110SG	16-Pin Ceramic DIP	109	–55°C to +125°C
INA110KP	16-Pin Plastic DIP	180	0°C to +70°C
INA110KU	SOL-16 SOIC	211	0°C to +70°C

NOTE: (1) For detailed drawing and dimension table, please see end of data sheet, or Appendix C of Burr-Brown IC Data Book.

ELECTROSTATIC DISCHARGE SENSITIVITY

This integrated circuit can be damaged by ESD. Burr-Brown recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.