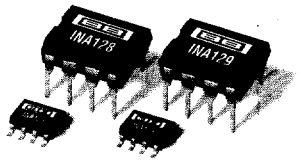
BURR-BROWN®



INA128
INA129

www.burr-brown.com/databook/INA128.html

Precision, Low Power INSTRUMENTATION AMPLIFIERS

FEATURES

- LOW OFFSET VOLTAGE: 50μV max
- LOW DRIFT: 0.5μV/°C max
- LOW INPUT BIAS CURRENT: 5nA max
- HIGH CMR: 120dB min
- INPUTS PROTECTED TO ±40V
- WIDE SUPPLY RANGE: ±2.25 to ±18V
- LOW QUIESCENT CURRENT: 700μA
- 8-PIN PLASTIC DIP, SO-8

APPLICATIONS

- BRIDGE AMPLIFIER
- THERMOCOUPLE AMPLIFIER
- RTD SENSOR AMPLIFIER
- MEDICAL INSTRUMENTATION
- DATA ACQUISITION

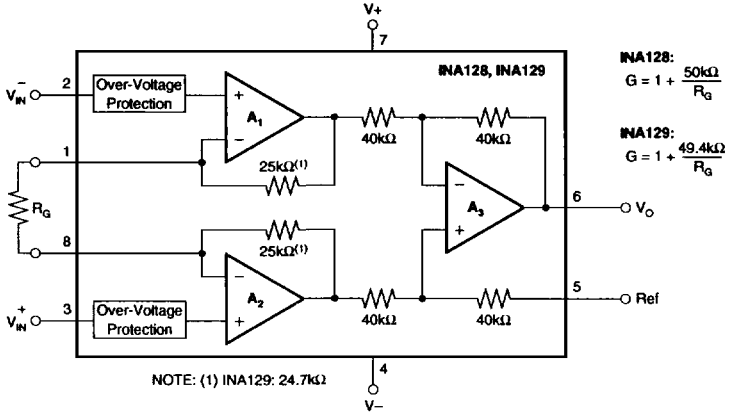
DESCRIPTION

The INA128 and INA129 are low power, general purpose instrumentation amplifiers offering excellent accuracy. Their versatile 3-op amp design and small size make them ideal for a wide range of applications. Current-feedback input circuitry provides wide bandwidth even at high gain (200kHz at G = 100).

A single external resistor sets any gain from 1 to 10,000. INA128 provides an industry standard gain equation; INA129's gain equation is compatible with the AD620.

The INA128/INA129 is laser trimmed for very low offset voltage (50μV), drift (0.5μV/°C) and high common-mode rejection (120dB at G ≥ 100). It operates with power supplies as low as ±2.25V, and quiescent current is only 700μA—ideal for battery operated systems. Internal input protection can withstand up to ±40V without damage.

The INA128/INA129 is available in 8-pin plastic DIP, and SO-8 surface-mount packages, specified for the –40°C to +85°C temperature range. The INA128 is also available in dual configuration, the INA2128.



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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

At T_A = +25°C, V_S = ±15V, R_L = 10kΩ, unless otherwise noted.

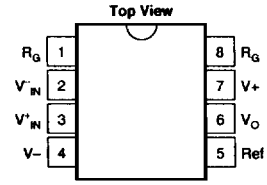
PARAMETER	CONDITIONS	INA128P, U INA129P, U MIN	INA128P, U INA129P, U TYP	INA128P, U INA129P, U MAX	INA128PA, UA INA129PA, UA MIN	INA128PA, UA INA129PA, UA TYP	INA128PA, UA INA129PA, UA MAX	UNITS
INPUT								
Offset Voltage, RTI								
Initial	T_A = +25°C		±10 ±100/G	±50 ±500/G		±25 ±100/G	±125 ±1000/G	µV
vs Temperature	$T_A = T_{MIN}$ to T_{MAX}		±0.2 ± 2/G	±0.5 ± 20/G		±0.2 ± 5/G	±1 ± 20/G	µV/°C
vs Power Supply	V_S = ±2.25V to ±18V		±0.2 ±20/G	±1 ±100/G		*	±2 ±200/G	µV/V
Long-Term Stability			±0.1 ±3/G			*		µV/mo
Impedance, Differential			10^{10} || 2			*		Ω || pF
Common-Mode			10^{11} || 9			*		Ω || pF
Common-Mode Voltage Range[1]	V_O = 0V	(V+) – 2	(V+) – 1.4		*	*		V
		(V–) + 2	(V–) + 1.7		*	*		V
Safe Input Voltage				±40			*	V
Common-Mode Rejection	V_{CM} = ±13V, ΔR_S = 1kΩ							
	G=1	80	86		73	*		dB
	G=10	100	106		93	*		dB
	G=100	120	125		110	*		dB
	G=1000	120	130		110	*		dB
BIAS CURRENT			±2	±5		*	±10	nA
vs Temperature			±30			*		pA/°C
Offset Current			±1	±5		*	±10	nA
vs Temperature			±30			*		pA/°C
NOISE VOLTAGE, RTI	G = 1000, R_S = 0Ω							
f = 10Hz			10			*		nV/√Hz
f = 100Hz			8			*		nV/√Hz
f = 1kHz			8			*		nV/√Hz
f_B = 0.1Hz to 10Hz			0.2			*		µVp-p
Noise Current								
f=10Hz			0.9			*		pA/√Hz
f=1kHz			0.3			*		pA/√Hz
f_B = 0.1Hz to 10Hz			30			*		pAp-p
GAIN								
Gain Equation, INA128			1 + (50kΩ/R_G)			*		V/V
INA129			1 + (49.4kΩ/R_G)			*		V/V
Range of Gain		1		10000	*		*	V/V
Gain Error	G=1		±0.01	±0.024		*	±0.1	%
	G=10		±0.02	±0.4		*	±0.5	%
	G=100		±0.05	±0.5		*	±0.7	%
	G=1000		±0.5	±1		*	±2	%
Gain vs Temperature[2]	G=1		±1	±10		*	*	ppm/°C
50kΩ (or 49.4kΩ) Resistance[2, 3]			±25	±100		*	*	ppm/°C
Nonlinearity	V_O = ±13.6V, G=1		±0.0001	±0.001		*	±0.002	% of FSR
	G=10		±0.0003	±0.002		*	±0.004	% of FSR
	G=100		±0.0005	±0.002		*	±0.004	% of FSR
	G=1000		±0.001	(Note 4)		*	*	% of FSR
OUTPUT								
Voltage: Positive	R_L = 10kΩ	(V+) – 1.4	(V+) – 0.9		*	*		V
Negative	R_L = 10kΩ	(V–) + 1.4	(V–) + 0.8		*	*		V
Load Capacitance Stability			1000			*		pF
Short-Circuit Current			+6/–15			*		mA
FREQUENCY RESPONSE								
Bandwidth, –3dB	G=1		1.3			*		MHz
	G=10		700			*		kHz
	G=100		200			*		kHz
	G=1000		20			*		kHz
Slew Rate	V_O = ±10V, G=10		4			*		V/µs
Settling Time, 0.01%	G=1		7			*		µs
	G=10		7			*		µs
	G=100		9			*		µs
	G=1000		80			*		µs
Overload Recovery	50% Overdrive		4			*		µs
POWER SUPPLY								
Voltage Range		±2.25	±15	±18	*	*	*	V
Current, Total	V_{IN} = 0V		±700	±750		*	*	µA
TEMPERATURE RANGE								
Specification		–40		85	*		*	°C
Operating		–40		125	*		*	°C
θ_{JA} 8-Pin Dip			80			*		°C/W
SO-8 SOIC			150			*		°C/W

* Specification same as INA128P, U or INA129P, U.

NOTE: (1) Input common-mode range varies with output voltage—see typical curves. (2) Guaranteed by wafer test. (3) Temperature coefficient of the 50kΩ (or 49.4kΩ) term in the gain equation. (4) Nonlinearity measurements in G = 1000 are dominated by noise. Typical nonlinearity is ±0.001%.

PIN CONFIGURATION

8-Pin DIP and SO-8



ABSOLUTE MAXIMUM RATINGS

Supply Voltage	±18V
Analog Input Voltage Range	±40V
Output Short-Circuit (to ground)	Continuous
Operating Temperature	–40°C to +125°C
Storage Temperature	–40°C to +125°C
Junction Temperature	+150°C
Lead Temperature (soldering, 10s)	+300°C

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.

ORDERING INFORMATION

PRODUCT	PACKAGE	PACKAGE DRAWING NUMBER(1)	TEMPERATURE RANGE
INA128PA	8-Pin Plastic DIP	006	–40°C to +85°C
INA128P	8-Pin Plastic DIP	006	–40°C to +85°C
INA128UA	SO-8 Surface-Mount	182	–40°C to +85°C
INA128U	SO-8 Surface-Mount	182	–40°C to +85°C
INA129PA	8-Pin Plastic DIP	006	–40°C to +85°C
INA129P	8-Pin Plastic DIP	006	–40°C to +85°C
INA129UA	SO-8 Surface-Mount	182	–40°C to +85°C
INA129U	SO-8 Surface-Mount	182	–40°C to +85°C

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