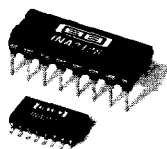


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INA2128

www.burr-brown.com/databook/INA2128.html

Dual, Low Power INSTRUMENTATION AMPLIFIER

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: ±2.25V to ±18V
- LOW QUIESCENT CURRENT: 700μA / IA
- 16-PIN PLASTIC DIP, SOL-16

APPLICATIONS

- SENSOR AMPLIFIER
THERMOCOUPLE, RTD, BRIDGE
- MEDICAL INSTRUMENTATION
- MULTIPLE-CHANNEL SYSTEMS
- BATTERY OPERATED EQUIPMENT

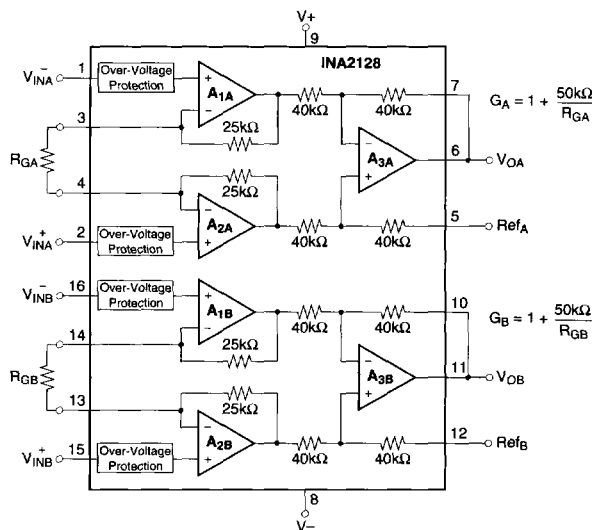
DESCRIPTION

The INA2128 is a dual, low power, general purpose instrumentation amplifier offering excellent accuracy. Its versatile 3-op amp design and small size make it 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. Internal input protection can withstand up to ±40V without damage.

The INA2128 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 per IA—ideal for battery operated and multiple-channel systems.

The INA2128 is available in 16-pin plastic DIP, and SOL-16 surface-mount packages, specified for the -40°C to +85°C temperature range.



SPECIFICATIONS

At $T_A = +25^\circ\text{C}$, $V_S = \pm 15\text{V}$, $R_L = 10\text{k}\Omega$, unless otherwise noted.

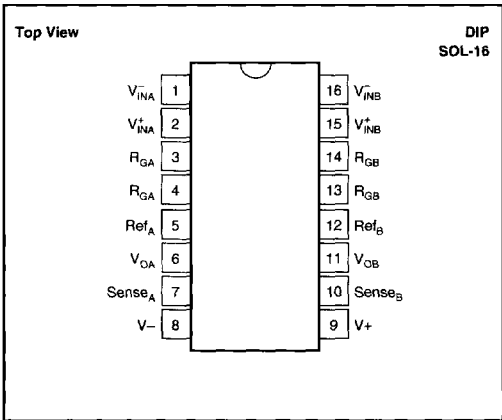
PARAMETER	CONDITIONS	1NA128P, U			1NA128PA, UA			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
INPUT								
Offset Voltage, RTI	$T_A = +25^{\circ}\text{C}$ $T_A = T_{\text{MIN}} \text{ to } T_{\text{MAX}}$ $V_S = \pm 2.25\text{V to } \pm 18\text{V}$		$\pm 10 \pm 100/\text{G}$	$\pm 50 \pm 500/\text{G}$		$\pm 25 \pm 100/\text{G}$	$\pm 125 \pm 1000/\text{G}$	μV
Initial			$\pm 0.2 \pm 2/\text{G}$	$\pm 0.5 \pm 20/\text{G}$		$\pm 0.2 \pm 5/\text{G}$	$\pm 1 \pm 20/\text{G}$	$\mu\text{V}/^{\circ}\text{C}$
vs Temperature			$\pm 0.2 \pm 20/\text{G}$	$\pm 1 \pm 100/\text{G}$		*	*	$\mu\text{V}/\text{V}$
vs Power Supply			$\pm 0.1 \pm 3/\text{G}$			*	*	$\mu\text{V}/\text{mV}$
Long-Term Stability			$10^{10} \parallel 2$			*	*	$\Omega \parallel \text{pF}$
Impedance, Differential	$V_O = 0\text{V}$		$10^{11} \parallel 9$			*	*	$\Omega \parallel \text{pF}$
Common-Mode					*	*	*	V
Common-Mode Voltage Range ⁽¹⁾		$(V+) - 2$ $(V-) + 2$	$(V+) - 1.4$ $(V-) + 1.7$		*	*	*	V
Safe Input Voltage				± 40			*	V
Common-Mode Rejection		$V_{\text{CM}} = \pm 13\text{V}, \Delta R_S = 1\text{k}\Omega$						*
		80	86		73	*		dB
	G=1	100	106		93	*		dB
	G=10	120	125		110	*		dB
	G=100	120	130		110	*		dB
	G=1000							
BIAS CURRENT								
vs Temperature			± 2	± 5		*	± 10	nA
Offset Current			± 30			*		$\text{pA}/^{\circ}\text{C}$
vs Temperature			± 1	± 5		*	± 10	nA
			± 30			*		$\text{pA}/^{\circ}\text{C}$
NOISE VOLTAGE, RTI	$G = 1000, R_S = 0\Omega$							
$f = 10\text{Hz}$			10			*		$\text{nV}/\sqrt{\text{Hz}}$
$f = 100\text{Hz}$			8			*		$\text{nV}/\sqrt{\text{Hz}}$
$f = 1\text{kHz}$			8			*		$\text{nV}/\sqrt{\text{Hz}}$
$f_B = 0.1\text{Hz to } 10\text{Hz}$			0.2			*		$\mu\text{Vp-p}$
Noise Current								
$f = 10\text{Hz}$			0.9			*		$\text{pA}/\sqrt{\text{Hz}}$
$f = 1\text{kHz}$			0.3			*		$\text{pA}/\sqrt{\text{Hz}}$
$f_B = 0.1\text{Hz to } 10\text{Hz}$			30			*		pAp-p
GAIN								
Gain Equation			$1 + (50\text{k}\Omega/R_G)$			*		V/V
Range of Gain		1		10000	*			V/V
Gain Error	G=1		± 0.01	± 0.024		*	*	%
	G=10		± 0.02	± 0.4		*	± 0.1	%
	G=100		± 0.05	± 0.5		*	± 0.5	%
	G=1000		± 0.5	± 1		*	± 0.7	%
	G=1		± 1	± 10		*	± 2	%
Gain vs Temperature ⁽²⁾			± 25	± 100		*	*	$\text{ppm}/^{\circ}\text{C}$
50kΩ Resistance ^(2, 3)			± 0.0001	± 0.001		*	*	$\text{ppm}/^{\circ}\text{C}$
Nonlinearity	$V_O = \pm 13.6\text{V}, G=1$		± 0.0003	± 0.002		*	± 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	$R_L = 10\text{k}\Omega$	$(V+) - 1.4$	$(V+) - 0.9$		*	*		V
Negative	$R_L = 10\text{k}\Omega$	$(V-) + 1.4$	$(V-) + 0.8$		*	*		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	$V_O = \pm 10\text{V}, G=10$		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	$V_{\text{IN}} = 0\text{V}$		± 1.4	± 1.5		*	*	mA
TEMPERATURE RANGE								
Specification		-40		85	*		*	$^{\circ}\text{C}$
Operating		-40		125	*		*	$^{\circ}\text{C}$
θ_{JA}			80			*		$^{\circ}\text{C}/\text{W}$

* Specification same as INA2128P, U

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

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PIN CONFIGURATION



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
INA2128PA	16-Pin Plastic DIP	180	-40°C to +85°C
INA2128P	16-Pin Plastic DIP	180	-40°C to +85°C
INA2128UA	SOL-16 Surface-Mount	211	-40°C to +85°C
INA2128U	SOL-16 Surface-Mount	211	-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.

INA2128

4

INSTRUMENTATION AMPLIFIERS

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