LAMPIRAN

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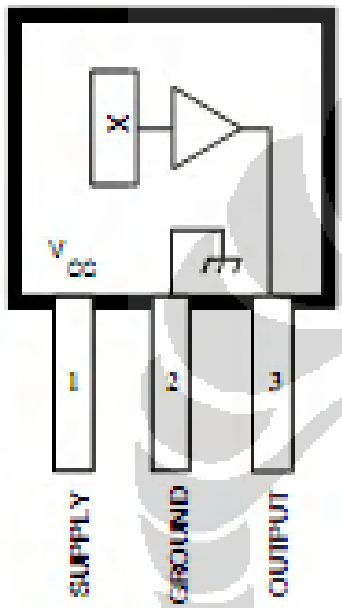
1. Datasheet UGN3503
2. Datasheet LM358
3. Datasheet PGA204

3503

Data Sheet 27501.8*

RATIOMETRIC, LINEAR HALL-EFFECT SENSORS



Dwg. PH-008

Rotating is shown viewed from branded side.

The UGN3503LT, UGN3503U, and UGN3503UA Hall-effect sensors accurately track extremely small changes in magnetic flux density—changes generally too small to operate Hall-effect switches.

As motion detectors, gear-tooth sensors, and proximity detectors, they are magnetically driven mirrors of mechanical events. As sensitive monitors of electromagnets, they can effectively measure a system's performance with negligible system loading while providing isolation from contaminated and electrically noisy environments.

Each Hall-effect integrated circuit includes a Hall sensing element, linear amplifier, and emitter-follower output stage. Problems associated with handling tiny analog signals are minimized by having the Hall cell and amplifier on a single chip.

Three package styles provide a magnetically optimized package for most applications. Package suffix 'LT' is a miniature SOT-89/TO-243AA transistor package for surface-mount applications; suffix 'U' is a miniature three-lead plastic SIP, while 'UA' is a three-lead ultra-mini-SIP. All devices are rated for continuous operation over the temperature range of -20°C to +85°C.

FEATURES

- Extremely Sensitive
- Flat Response to 23 kHz
- Low-Noise Output
- 4.5 V to 6 V Operation
- Magnetically Optimized Package

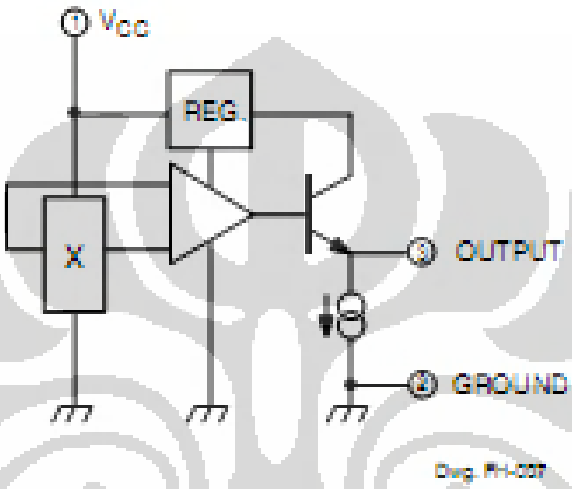
ABSOLUTE MAXIMUM RATINGS

Supply Voltage, V_{CC} ..... 8 V
Magnetic Flux Density, B ..... Unlimited
Operating Temperature Range,
T_A ..... -20°C to +85°C
Storage Temperature Range,
T_S ..... -65°C to +150°C

Always order by complete part number, e.g., UGN3503UA .

3503
RATIOMETRIC, LINEAR HALL-EFFECT SENSORS

FUNCTIONAL BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS at T_A = +25°C, V_{CC} = 5 V

Characteristic	Symbol	Test Conditions	Limits			Units
			Min.	Typ.	Max.	
Operating Voltage	V_{CC}		4.5	—	6.0	V
Supply Current	I_{CC}		—	9.0	13	mA
Quiescent Output Voltage	V_{OUT}	B = 0 G	2.25	2.50	2.75	V
Sensitivity	ΔV_{OUT}	B = 0 G to ±900 G	0.75	1.30	1.75	mV/G
Bandwidth (-3 dB)	BW		—	23	—	kHz
Broadband Output Noise	V_{no}	BW = 10 Hz to 10 kHz	—	90	—	µV
Output Resistance	R_{OUT}		—	60	220	Ω

All output-voltage measurements are made with a voltmeter having an input impedance of at least 10 kΩ.

Magnetic flux density is measured at most sensitive area of device located 0.016" (0.41 mm) below the branded face of the "U" package; 0.020" (0.51 mm) below the branded face of the "UA" package; and 0.030" (0.76 mm) below the branded face of the "LT" package.

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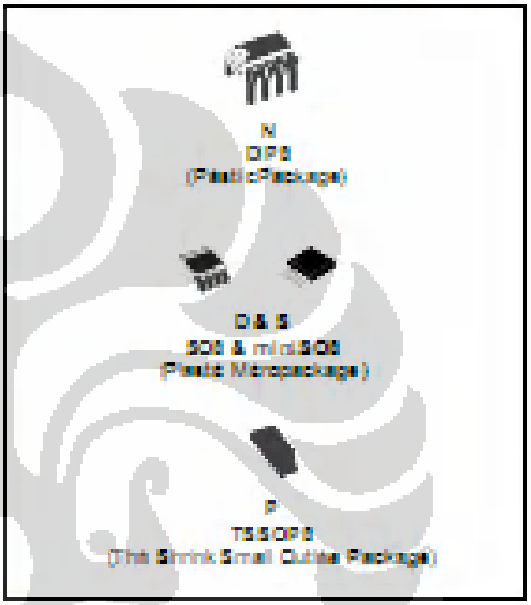
LM158,A-LM258,A
LM358,A

LOW POWER DUAL OPERATIONAL AMPLIFIERS

- INTERNALLY FREQUENCY COMPENSATED
- LARGE DC VOLTAGE GAIN: 100dB
- WIDE BANDWIDTH (unity gain): 1.1MHz (temperature compensated)
- VERY LOW SUPPLY CURRENT/OP (500µA) ESSENTIALLY INDEPENDENT OF SUPPLY VOLTAGE
- LOW INPUT BIAS CURRENT: 20nA (temperature compensated)
- LOW INPUT OFFSET VOLTAGE: 2mV
- LOW INPUT OFFSET CURRENT: 2nA
- INPUT COMMON-MODE VOLTAGE RANGE INCLUDES GROUND
- DIFFERENTIAL INPUT VOLTAGE RANGE EQUAL TO THE POWER SUPPLY VOLTAGE
- LARGE OUTPUT VOLTAGE SWING: 0V TO (Vcc - 1.5V)



DESCRIPTION

These circuits consist of two independent, high gain, internally frequency compensated which were designed specifically to operate from a single power supply over a wide range of voltages. The low power supply drain is independent of the magnitude of the power supply voltage.

Application areas include transducer amplifiers, dc gain blocks and all the conventional op-amp circuits which now can be more easily implemented in single power supply systems. For example, these circuits can be directly supplied with the standard +5V which is used in logic systems and will easily provide the required interface electronics without requiring any additional power supply.

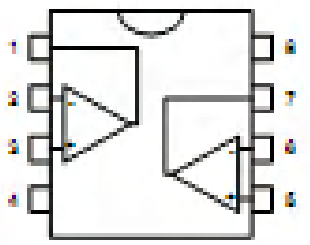
In the linear mode the input common-mode voltage range includes ground and the output voltage can also swing to ground, even though operated from only a single power supply voltage.

ORDER CODE

Part Number	Temperature Range	Package			
		N	S	D	P
LM158,A	-55°C, +125°C	•		•	•
LM258,A	-40°C, +105°C	•		•	•
LM358,A	0°C, +70°C	•	•	•	•
Example : LM358N					

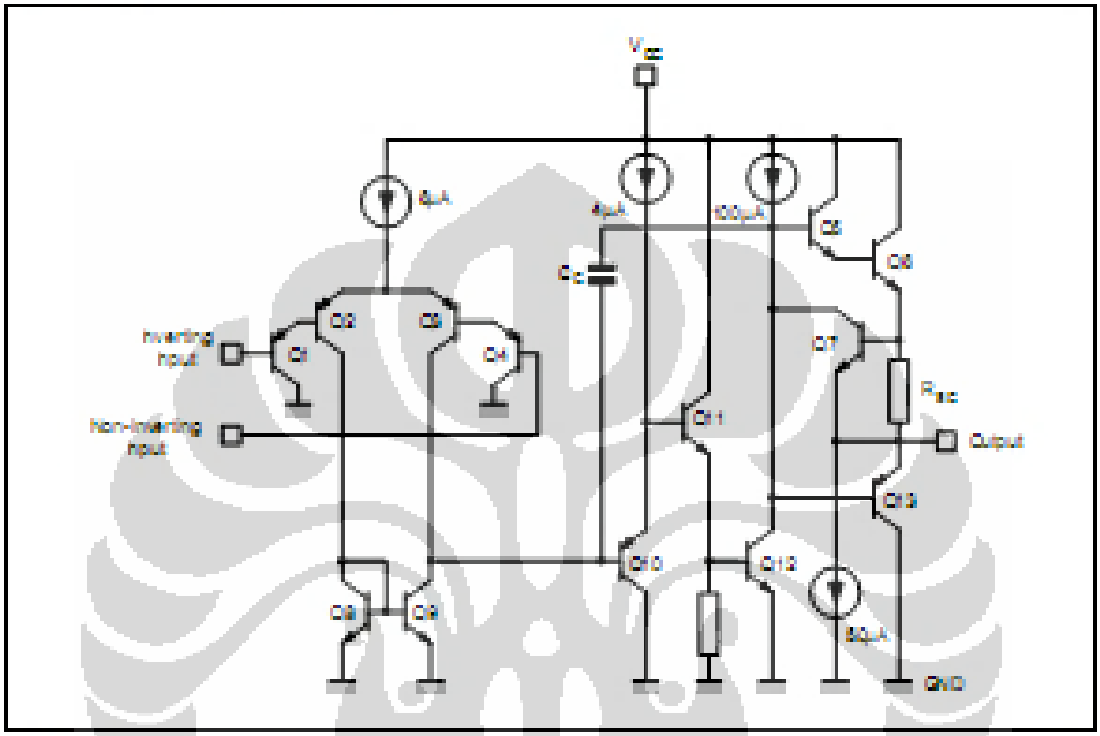
N = Dual In Line Package (DIP)
D = Small Outline Package (SO) - also available in Tape & Reel (DT)
S = Small Outline Package (miniSO) - only available in Tape & Reel (DT)
P = Thin Shrink Small Outline Package (TSSOP) - only available in Tape & Reel (PT)

PIN CONNECTIONS (top view)



1 -Output 1
2 -Inverting input
3- Non-inverting input
4- Vcc-
5- Non-inverting input 2
6 -Inverting input 2
7 -Output 2
8- Vcc+

SCHEMATIC DIAGRAM (1/2 LM158)



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	LM158A	LM258,A	LM358,A	Unit
V_{CC}	Supply voltage	+/-16 or 32			V
V_i	Input Voltage	-0.3 to +32			V
V_{id}	Differential Input Voltage	+32			V
P_{tot}	Power Dissipation [1]	500			mW
	Output Short-circuit Duration [2]	Infinite			
I_{in}	Input Current [3]	50			mA
T_{oper}	Operating Free-air Temperature Range	-55 to +125	-40 to +105	0 to +70	°C
T_{stg}	Storage Temperature Range	-65 to +150			°C

1. Power dissipation must be considered to ensure maximum junction temperature (T_j) is not exceeded.
2. Short-circuits from the output to V_{CC} can cause excessive heating if V_{CC} > 15V. The maximum output current is approximately 40mA independent of the magnitude of V_{CC}. Destructive dissipation can result from simultaneous short-circuit on all amplifiers.
3. This input current only exists when the voltage at any of the input leads is driven negative. It is due to the collector-base junction of the input PNP transistor becoming forward biased and thereby acting as input diode clamps. In addition to this diode action, there is also NPN parasitic action on the IC chip. This transistor action can cause the output voltages of the OP amps to go to the V_{CC} voltage level (or to ground for a large overdrive) for the time duration that an input is driven negative.
This is not destructive and normal output will restore again for input voltage higher than -0.3V.

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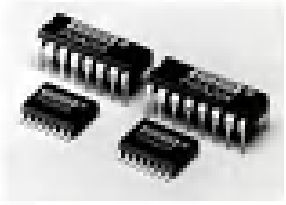


PGA204
PGA205

Programmable Gain
INSTRUMENTATION AMPLIFIER

FEATURES

- DIGITALLY PROGRAMMABLE GAIN:
  PGA204: G=1, 10, 100, 1000V/V
  PGA205: G=1, 2, 4, 8V/V
- LOW OFFSET VOLTAGE: 50µV max
- LOW OFFSET VOLTAGE DRIFT: 0.25µV/°C
- LOW INPUT BIAS CURRENT: 2nA max
- LOW QUIESCENT CURRENT: 5.2mA typ
- NO LOGIC SUPPLY REQUIRED
- 16-PIN PLASTIC DIP, SOL-16 PACKAGES

APPLICATIONS

- DATA ACQUISITION SYSTEM
- GENERAL PURPOSE ANALOG BOARDS
- MEDICAL INSTRUMENTATION

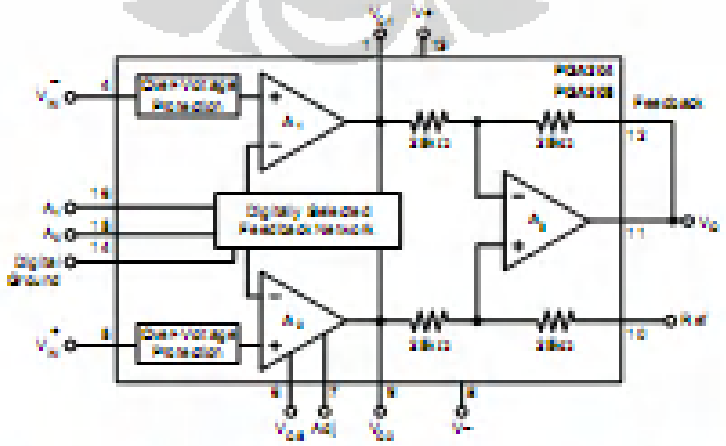
DESCRIPTION

The PGA204 and PGA205 are low cost, general purpose programmable-gain instrumentation amplifiers offering excellent accuracy. Gains are digitally selected: PGA204—1, 10, 100, 1000 and PGA205—1, 2, 4, 8V/V. The precision and versatility, and low cost of the PGA204 and PGA205 make them ideal for a wide range of applications.

Gain is selected by two TTL or CMOS-compatible address lines, A_0 and A_1. Internal input protection can withstand up to ±40V on the analog inputs without damage.

The PGA204 and PGA205 are laser trimmed for very low offset voltage (50µV), drift (0.25µV/°C) and high common-mode rejection (115dB at G=1000). They operate with power supplies as low as ±4.5V, allowing use in battery operated systems. Quiescent current is 5mA.

The PGA204 and PGA205 are available in 16-pin plastic DIP, and SOL-16 surface-mount packages, specified for the –40°C to +85°C temperature range.



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Tel: (520) 746-1111 • Twx: 910-952-1111 • Cable: BBRCORP • Telex: 066-6491 • FAX: (520) 889-1510 • Immediate Product Info: (800) 548-6132

PDS-1175A

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SBOS022

SPECIFICATIONS

ELECTRICAL

PGA204 G=1, 10, 100, 1000V/V

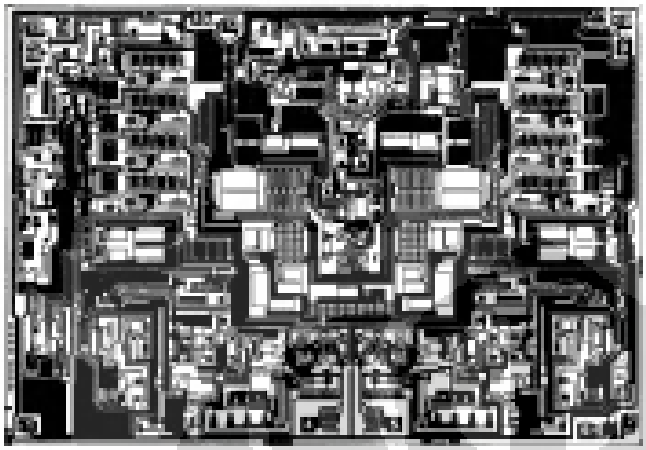
At T_A = +25°C, V_S = ±15V, and R_L = 2kΩ unless otherwise noted.

PARAMETER	CONDITIONS	PGA204BP, BU			PGA204AP, AU			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
INPUT								
Offset Voltage, RTI	T_A = +25°C		±(50+300/G)	±(500+1000/G)		±(80+300/G)	±(1250+1000/G)	µV
vs Temperature	T_A = T_{MIN} to T_{MAX}		±(0.7+5/G)	±(3.5+5/G)		±(2.5+5/G)	±(7+10/G)	µV/°C
vs Power Supply	V_S = ±5V to ±18V		63+300/G	91+1000/G		-	-	µV/V
Long-Term Stability			±(0.3+0.5/G)			-		µV/mo
Impedance, Differential			10^{10} || 6			-		Ω || pF
Common-Mode			10^{10} || 6			-		Ω || pF
Input Common-Mode Range	V_O = 0V (see text)	±10	±13.7		-	-		V
Safe Input Voltage				±40			-	V
Common-Mode Rejection	V_{CM} = ±10V, ΔR_S = 1kΩ							
	G=1	80	96		76	90		dB
	G=10	86	114		80	106		dB
	G=100	110	123		106	110		dB
	G=1000	116	123		106	110		dB
BIAS CURRENT			±0.5	±2		-	±5	nA
vs Temperature			±8			-		pA/°C
Offset Current			±0.5	±2		-	-	nA
vs Temperature			±8			-		pA/°C
NOISE, Voltage, RTI [1] 0.1Hz	G=100, R_S=0Ω		18			-		nVrms
10Hz	G=100, R_S=0Ω		13			-		nV/√Hz
1kHz	G=100, R_S=0Ω		13			-		nV/√Hz
fB=0.1Hz to 10Hz	G=100, R_S=0Ω		0.6			-		µVp-p
Noise Current								
10Hz			0.6			-		pA/√Hz
1kHz			0.2			-		pA/√Hz
fB=0.1Hz to 10Hz			18			-		pAp-p
GAIN, Error	G=1		±0.05%	±0.03%		-	±0.05%	%
	G=10		±0.02%	±0.03%		-	±0.03%	%
	G=100		±0.02%	±0.03%		-	±0.03%	%
	G=1000		±0.05%	±0.05%		-	±0.1%	%
Gain vs Temperature	G=1 to 1000		±3.5	±15		-	-	ppm/°C
Nonlinearity	G=1		±0.0001%	±0.001%		-	±0.002%	% of FSR
	G=10		±0.0001%	±0.002%		-	±0.003%	% of FSR
	G=100		±0.0001%	±0.002%		-	±0.004%	% of FSR
	G=1000		±0.0005%	±0.01%		-	±0.02%	% of FSR
OUTPUT								
Voltage, Positive	I_O = 5mA, T_{MIN} to T_{MAX}	(V+)-1.8	(V+)-1.4		-	-		V
Negative	I_O = -5mA, T_{MIN} to T_{MAX}	(V-)+1.8	(V-)+1.3		-	-		V
Load Capacitance Stability			1000			-		pF
Short-Circuit Current			+23/-17			-		mA
FREQUENCY RESPONSE								
Bandwidth, -3dB	G=1		1			-		MHz
	G=10		80			-		kHz
	G=100		10			-		kHz
	G=1000		1			-		kHz
Slew Rate	V_O = ±10V, G=10	0.8	2.7		-	-		V/µs
Settling Time[2], 0.1%	G=1		32			-		µs
	G=10		33			-		µs
	G=100		100			-		µs
	G=1000		1000			-		µs
0.01%	G=1		33			-		µs
	G=10		36			-		µs
	G=100		140			-		µs
	G=1000		1000			-		µs
Overload Recovery	50% Overdrive		10			-		µs
DIGITAL LOGIC								
Digital Ground Voltage V_{DG}		V-		(V+)+4	-		-	V
Digital Low Voltage		V-		V_{DG}+0.8V	-		-	V
Digital Input Current			1				-	µA
Digital High Voltage		V_{DG}+2		V+	-		-	V
POWER SUPPLY, Voltage		±4.5	±15	±18	-	-	-	V
Current	V_S = ±5V		+8.2/-6.2	±8.8		-	±10	mA
TEMPERATURE RANGE								
Specification		-25		+85	-		-	°C
Operating		-40		+125	-		-	°C
θ_{JA}			80			-		°C/W

* Specification same as PGA204BP.

NOTES: (1) Input-referred noise voltage varies with gain. See typical curves. (2) Output voltage swing is tested for ±10V with ±15V power supplies. (3) Includes time to switch to a new gain.

DIE INFORMATION



PGA204/205 DIE TOPOGRAPHY

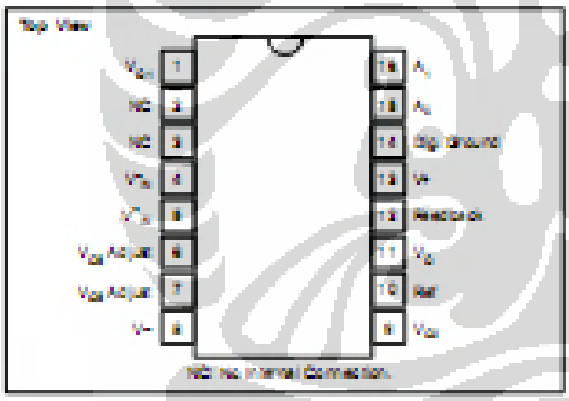
PAD	FUNCTION	PAD	FUNCTION
1	V_{O1}	9	V_{O2}
2	—	10	Ref
3	—	11	V_I
4	V^-_{IN}	12	Feedback
5	V^+_{IN}	13	V+
6	V_{G2} Adj	14	Dig. Ground
7	V_{G1} Adj	15	A_0
8	V-	16	A_1

Substrate (back) internally connected to V- power supply.

MECHANICAL INFORMATION

	MILS (0.001")	MILLIMETERS
Die Size	186 x 130 ± 5	4.72 x 3.30 ± 0.13
Die Thickness	20 ±3	0.51 ±0.08
Min. Pad Size	4 x 4	0.1 x 0.1
Backing		Gold

PIN CONFIGURATION



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.