Monolithic Accelerometer with Signal Conditioning

ADXL181*

FEATURES

Complete Acceleration Measurement System on a Single Monolithic IC
Full-Scale Measurement Range:
+5 V Supply: –125 g, +250 g
+12 V Supply: –150 g, +880 g
Self-Test on Digital Command
Single Supply Operation
Sensitivity Precalibrated to 8 mV/g
Internal Buffer Amplifier for User Adjustable Sensitivity and Zero-g Level
Frequency Response: DC to 3 kHz
Post Filtering with External Passive Components
High Shock Survival: >2000 g Unpowered
Other Products Available Providing Different Sensitivities and Full-Scale Ranges

GENERAL DESCRIPTION

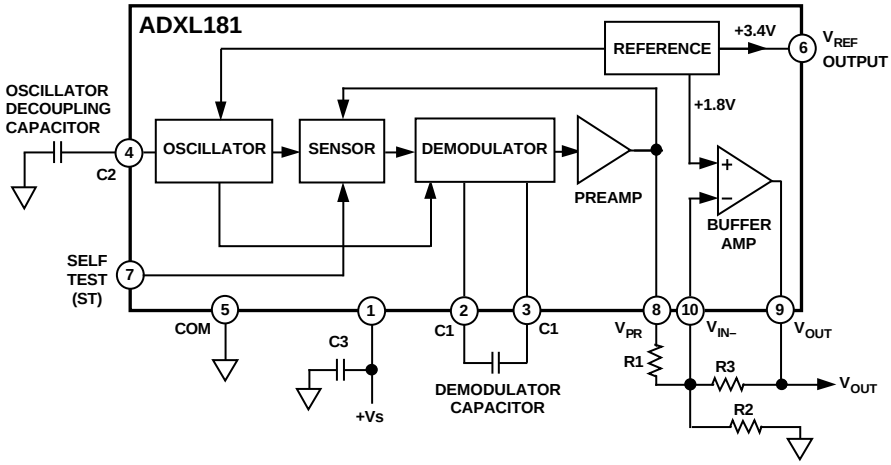
The ADXL181 is a complete acceleration measurement system on a single monolithic IC, using a surface micromachined capacitive measurement method. The analog output voltage is directly proportional to acceleration and is fully scaled, referenced, and temperature compensated, resulting in high accuracy and linearity over a wide temperature range. Internal circuitry implements a force-balance control loop that compensates for any mechanical sensor variations.

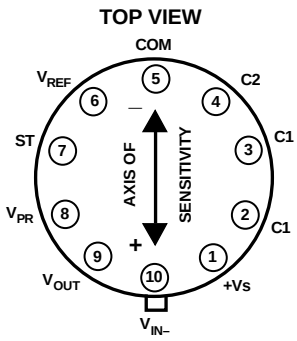
A TTL compatible self-test feature can electrostatically deflect the sensor beam at any time to verify device functionality.

An internal buffer amplifier has a 0.25 V to V_S – 0.25 V output range**.** This may be used to gain and offset adjust the output signal so that it has a symmetrical output range. The amplifier can also be used to gain adjust and filter the sensor output. No external active components are necessary to connect the output signal directly to an analog-to-digital converter or microcontroller.

The ADXL181 is packaged in a hermetic 10-pin TO-100 metal can. Contact factory for availability of devices with specific temperature ranges and performance.

FUNCTIONAL BLOCK DIAGRAM AND PINOUT





10-PIN TO-100 HEADER PACKAGE

NOTE:
AXIS OF SENSITIVITY IS IN PLANE OF PIN 5 TO TAB.

***Patent pending.**

This is a preliminary data sheet. To obtain the most recent version or complete data sheet, call our fax retrieval system at 1-800-446-6212.

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ADXL181–SPECIFICATIONS (T_A = +25°C, V_S = +5 V, @ Acceleration = 0 g, and C1 = C2 = 0.022 µF unless otherwise noted)

Parameter	Min	Typ	Max	Units
SENSITIVITY				
+25°C		8		mV/g
Temperature Drift		±0.75		% of Reading
ZERO g BIAS LEVEL				
+25°C		8		V
T_{MIN}–T_{MAX}				V
Temperature Drift		±75		mV
VOLTAGE NOISE DENSITY		65		µV/√Hz
SENSOR INPUT				
FS Measurement Range[1]	–125		+250	g
Nonlinearity		0.2		% of FS
Alignment Error		±1		Degrees
Transverse Sensitivity		±2		%

NOTES
[1]Accelerations up to –150 g, +880 g using a +12 V Supply.
Specifications subject to change without notice.

ELECTRICAL CHARACTERISTICS (T_A = T_{MIN} to T_{MAX}, V_S = +5 V ± 5% @ Acceleration = 0 g, and C1 = C2 = 0.022 µF unless otherwise noted)

Parameter	Conditions	Min	Typ	Max	Units
PREAMPLIFIER OUTPUT					
Power Supply Rejection	DC	30	40		dB
Voltage Swing	+25°C	0.25		V_S – 0.25	V
Current Output	Source or Sink	30	80		µA
Capacitive Load Drive			100		pF
SELF-TEST INPUT					
Output Change at V_{PR}					
ST Pin from Logic "0" to "l"		–0.80	–0.90	–1.00	V
Logic "1" Voltage		2.0			V
Logic "0" Voltage				0.8	V
Input Impedance	To Common		50		kΩ
FREQUENCY RESPONSE					
3 dB Equation C1> = 0.015 µF	f = 3 dB = (66/C1 in µF) ± 40%				
Bandwidth	C1 = 0.022 µF		3000		Hz
	C1 = TBD		10,000		Hz
Sensor Resonant Frequency			24		kHz
+3.4 VOLT REFERENCE					
Output Voltage Initial	+25°C	3.350	3.400	3.450	V
Output Temperature Drift			±10		mV
Power Supply Rejection	DC	40	60		dB
Output Current	(Sourcing)	500			µA
BUFFER AMPLIFIER					
Input Offset Voltage	Deviation from Nominal 1.800 V		±10	±25	mV
Input Bias Current			5	20	nA
Open Loop Gain	DC		80		dB
Unity Gain Bandwidth			200		kHz
Output Voltage Swing	I_{OUT} = 100 µA	0.25		V_S – 0.25	V
Capacitive Load Drive		1000			pF
POWER SUPPLY					
Specified Performance	5 V Supply	+4.75		+5.25	V
	12 V Supply	+11.6		+12.6	V
Quiescent Supply Current	5 V Supply		11	14	mA
TEMPERATURE RANGE		–55		+125	°C

This information applies to a product under development. Its characteristics and specifications are subject to change without notice. Analog Devices assumes no obligation regarding future manufacture unless otherwise agreed to in writing.