Small and Thin ±5 *g* iMEMS® Accelerometer

ADXL320

FEATURES

Small and thin
4 mm × 4 mm × 1.45 mm LFCSP package
2 m*g* resolution at 60 Hz
Wide supply voltage range: 2.4 V to 5.25 V
Low power: 350 µA at V_S = 2.4 V (typ)
Good zero *g* bias stability
Good sensitivity accuracy
X-axis and Y-axis aligned to within 0.1° (typ)
BW adjustment with a single capacitor
Single-supply operation
10,000 *g* shock survival
Compatible with Sn/Pb and Pb-free solder processes

APPLICATIONS

Cost-sensitive motion- and tilt-sensing applications
Smart hand-held devices
Mobile phones
Sports and health-related devices
PC security and PC peripherals

GENERAL DESCRIPTION

The ADXL320 is a low cost, low power, complete dual-axis accelerometer with signal conditioned voltage outputs, which is all on a single monolithic IC. The product measures acceleration with a full-scale range of ±5 *g* (typical). It can also measure both dynamic acceleration (vibration) and static acceleration (gravity).

The ADXL320's typical noise floor is 250 µg/√Hz, allowing signals below 2 m*g* to be resolved in tilt-sensing applications using narrow bandwidths (<60 Hz).

The user selects the bandwidth of the accelerometer using capacitors C_X and C_Y at the X_{OUT} and Y_{OUT} pins. Bandwidths of 0.5 Hz to 2.5 kHz may be selected to suit the application.

The ADXL320 is available in a very thin 4 mm × 4 mm × 1.45 mm, 16-lead, plastic LFCSP.

FUNCTIONAL BLOCK DIAGRAM

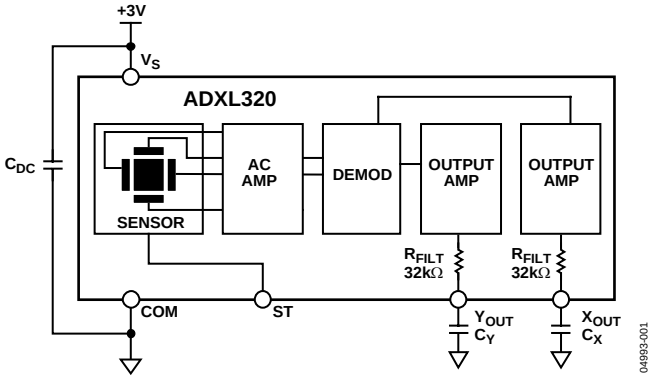

Figure 1.

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REVISION HISTORY

9/04—Revision 0: Initial Version

SPECIFICATIONS[1]

T_A = 25°C, V_S = 3 V, C_X = C_Y = 0.1 µF, Acceleration = 0 *g*, unless otherwise noted.

Table 1.

Parameter	Conditions	Min	Typ	Max	Unit
SENSOR INPUT	Each axis				
Measurement Range			±5		*g*
Nonlinearity	% of full scale		±0.2		%
Package Alignment Error			±1		Degrees
Alignment Error	X sensor to Y sensor		±0.1		Degrees
Cross Axis Sensitivity			±2		%
SENSITIVITY (RATIOMETRIC)[2]	Each axis				
Sensitivity at X_{OUT}, Y_{OUT}	V_S = 3 V	156	174	192	mV/*g*
Sensitivity Change due to Temperature[3]	V_S = 3 V		0.01		%/°C
ZERO *g* BIAS LEVEL (RATIOMETRIC)	Each axis				
0 *g* Voltage at X_{OUT}, Y_{OUT}	V_S = 3 V	1.3	1.5	1.7	V
0 *g* Offset Versus Temperature			±0.6		mg/°C
NOISE PERFORMANCE					
Noise Density	@ 25°C		250		µg/√Hz rms
FREQUENCY RESPONSE[4]					
C_X, C_Y Range[5]		0.002		10	µF
R_{FILT} Tolerance			32 ± 15%		kΩ
Sensor Resonant Frequency			5.5		kHz
SELF-TEST[6]					
Logic Input Low			0.6		V
Logic Input High			2.4		V
ST Input Resistance to Ground			50		kΩ
Output Change at X_{OUT}, Y_{OUT}	Self-test 0 to 1		55		mV
OUTPUT AMPLIFIER					
Output Swing Low	No load		0.3		V
Output Swing High	No load		2.5		V
POWER SUPPLY					
Operating Voltage Range		2.4		5.25	V
Quiescent Supply Current			0.48		mA
Turn-On Time[7]			20		ms
TEMPERATURE					
Operating Temperature Range		−20		70	°C

[1] All minimum and maximum specifications are guaranteed. Typical specifications are not guaranteed.
[2] Sensitivity is essentially ratiometric to V_S. For V_S = 2.7 V to 3.3 V, sensitivity is 154 mV/V/*g* to 194 mV/V/*g* typical.
[3] Defined as the output change from ambient-to-maximum temperature or ambient-to-minimum temperature.
[4] Actual frequency response controlled by user-supplied external capacitor (C_X, C_Y).
[5] Bandwidth = 1/(2 × π × 32 kΩ × C). For C_X, C_Y = 0.002 µF, bandwidth = 2500 Hz. For C_X, C_Y = 10 µF, bandwidth = 0.5 Hz. Minimum/maximum values are not tested.
[6] Self-test response changes cubically with V_S.
[7] Larger values of C_X, C_Y increase turn-on time. Turn-on time is approximately 160 × C_X or C_Y + 4 ms, where C_X, C_Y are in µF.

ABSOLUTE MAXIMUM RATINGS

Table 2.

Parameter	Rating
Acceleration (Any Axis, Unpowered)	10,000 *g*
Acceleration (Any Axis, Powered)	10,000 *g*
V_S	−0.3 V to +7.0 V
All Other Pins	(COM − 0.3 V) to (V_S + 0.3 V)
Output Short-Circuit Duration (Any Pin to Common)	Indefinite
Operating Temperature Range	−55°C to +125°C
Storage Temperature	−65°C to +150°C

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although this product features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

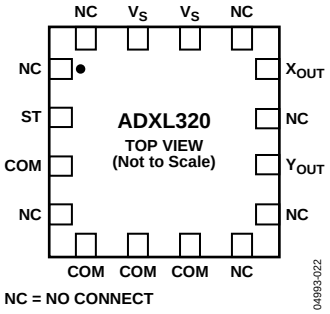

Figure 2. Pin Configuration

Table 3. Pin Function Descriptions

Pin No.	Mnemonic	Description
1	NC	Do Not Connect
2	ST	Self-Test
3	COM	Common
4	NC	Do Not Connect
5	COM	Common
6	COM	Common
7	COM	Common
8	NC	Do Not Connect
9	NC	Do Not Connect
10	Y_{OUT}	Y Channel Output
11	NC	Do Not Connect
12	X_{OUT}	X Channel Output
13	NC	Do Not Connect
14	V_S	2.4 V to 5.25 V
15	V_S	2.4 V to 5.25 V
16	NC	Do Not Connect

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