ANALOG DEVICES

Monolithic Accelerometer with Signal Conditioning

ADXL50

1.1 Scope.

This specification covers the detail requirements for a monolithic accelerometer with on-chip signal conditioning.

1.2 Part Number.

The complete part number per Table 1 of this specification is as follows:

Device	Part Number
−1	ADXL50S(X)/883B

1.23 Case Outline.

See Appendix 1 of general specification ADI-M-1000: package outline:

(X)	Package	Description
H	H-10A	10-Pin Header Package

1.3 Absolute Maximum Ratings.*

Acceleration (Any Axis, Unpowered) . . . . . 2000 g
Acceleration (Any Axis, Powered) . . . . . 500 g
$+V_S$ . . . . . −0.3 V to +7.0 V
Output Short Circuit Duration
(V_{PR}, V_{OUT}, V_{REF} Terminals to Common) . . . . . Indefinite
Operating Temperature . . . . . −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; the functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

1.5 Thermal Characteristics.

Thermal Resistance θ_{JA} = 130°C/W
θ_{JC} = 30°C/W

ADXL50—SPECIFICATIONS (V_S = +5 V, @ Acceleration = 0 g, and C1 = C2 = 0.022 µF unless otherwise noted.)

Table 1.

Parameter	ADXL50SH/883B Min	Typ	Max	Units
Sensitivity[1]				
+25°C	16.1	19.0	21.9	mV/g
Temperature Drift[2]		±1		% of Rdg
Zero g Bias Level[3]				
+25°C	1.60	1.80	2.00	V
T_{MIN}–T_{MAX}	1.60	1.80	2.00	V
Voltage Noise Density Sensor Input[4]		125	250	µV/√Hz
FS Measurement Range[5]	−50		+50	g
Nonlinearity[6]		0.2		of FS
Alignment Error[7]		±1		Degrees
Transverse Sensitivity[8]		±2		%

NOTES

[1]As measured at the preamplifier output, Vpr with 15 g p-p @ 100 Hz applied.

[2]Specification refers to the maximum change in parameter from its initial value at +25°C to its worst case value at T_{MIN} or T_{MAX}.

[3]As measured at Vpr

[4]BW = 0.1 Hz to 1 kHz. A capacitor, C2, greater than or equal to 0.022 µF must be connected from the oscillator decoupling capacitor pin to common.

[5]The axis of sensitivity of the device is a straight line drawn through the package along its most sensitive axis. For the 10-pin header (TO-100) package, this line passes through Pin 5 and the tab. See device connect and orientation figures.

[6]Best fit straight line. Full scale = 50 g.

[7]Alignment error is specified as the angle between the true and indicated axis of sensitivity. The ADXL50 output will be the true acceleration times the cosine of the alignment error angle.

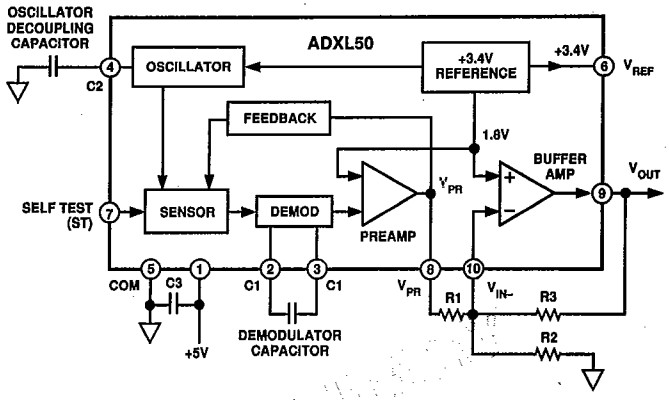
[8]Transverse sensitivity is measured with an applied acceleration which is 90° (i.e., transverse) from the indicated axis of sensitivity. Transverse sensitivity error is specified as the percent of transverse acceleration which appears at the Vpr output. This is the algebraic sum of the alignment and the inherent sensor sensitivity errors.

ELECTRICAL CHARACTERISTICS (V_S = +5 V ±5%, @ Acceleration = 0 g, and C1 = C2 = 0.022 µF unless otherwise noted.)

Parameter	Conditions	ADXL50S/883B Min	Typ	Max	Units
Preamplifier Output					
Power Supply Rejection	DC		10	32	mV/V
Voltage Swing	+25°C	0.25		V_S–1.4	V
Current Output	Source or Sink	30	80		µA
Capacitive Load Drive Capability			100		pF
Self Test Input					
Output Change at VPR[1]					
ST Pin from Logic "0" to "1"		−0.90	−1.00	−1.10	V
Logic "1" Voltage		2.0			V
Logic "0" Voltage				0.8	V
Input Impedance	To Common		50		kΩ
Frequency Response	C1 ≥ 0.015 µF				
3 dB Equation	f3 dB = (28.60/C1 in µF)	±40%			Hz
Bandwidth[2]	C1 = 0.022 µF	800	1300	2250	Hz
Sensor Resonant Frequency			24		kHz
+3.4 V Reference					
Output Voltage Initial	+25°C	3.350	3.400	3.450	V
Output Temperature Drift[3]			±10		mV
Power Supply Rejection	DC		1.0	10	mV/V
Output Current	(Sourcing)	500			µA
Buffer Amplifier					
Input Offset Voltage[4]	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 Capability		1000			pF
Power Supply Rejection	DC		1.0	10	mV/V
Power Supply					
Specified Performance		+4.75		+5.25	V
Operating Voltage Range		+4.75	+5.00	+6.0	V
Quiescent Supply Current			10	13	mA
Temperature Range		−55		+125	°C

NOTES
[1]Applying a logic "high" to the self-test input has an effect on the acceleration sensing element equivalent to applying an acceleration of minus 52.6 g to the ADXL50.
[2]This is the deviation from the ideal 3 dB bandwidth using an exact C1 value of 0.022 µF
[3]Specification refers to the maximum change in parameter from its initial value at +25°C to its worst case value at T_{MIN} or T_{MAX}.
[4]Input offset voltage is defined as an output voltage (referred to input at buffer $-V_{IN}$ terminal) when the buffer amplifier is connected as a follower. The voltage at this pin has a temperature drift proportional to that of the +3.4 V reference.
All min and max specifications are guaranteed. Typical specifications are not tested or guaranteed.

3.2.1 Functional Block Diagram and Terminal Assignments.

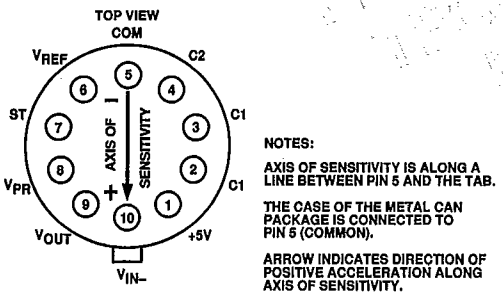


3.2.4 Microcircuit Technology Group.

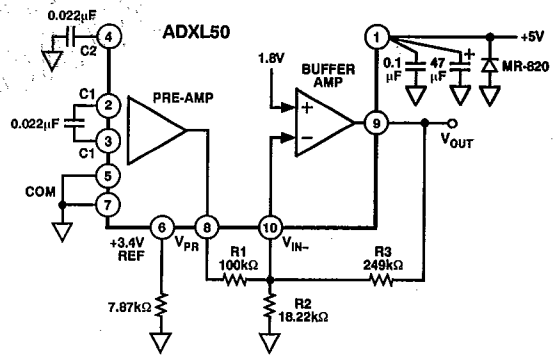
This microcircuit is covered by technology group (87).

4.2.1 Life Test/Burn-In Circuit.

Steady state life test is per MIL-STD-883.

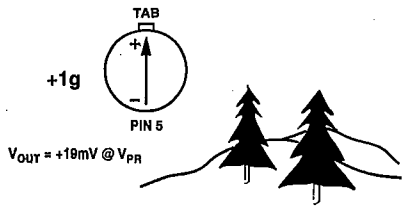


Connection Diagram

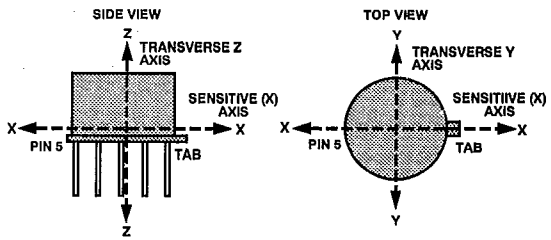


ESD Susceptibility

Electrostatic charges as high as 4000 volts, which readily accumulate on the human body and on test equipment, can discharge without detection. Although the ADXL50 features proprietary ESD protection circuitry, permanent damage may still occur on these devices if they are subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid any performance degradation or loss of functionality.



Device Output Polarity at Vpr



Device Orientation Figures