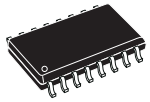
AIS226DS

MEMS inertial sensor
2-axis, low *g* accelerometer with digital output

Preliminary Data

Features

- 3.3 V single supply operation
- 1.8 V compatible IOs
- SPI digital output interface[a]
- 14 bit resolution
- Interrupt activated by motion
- Programmable interrupt threshold
- Embedded self-test
- High shock survivability
- ECOPACK® compliant
- Extended temperature range -40 °C to +105 °C



SO16W

Description

The AIS226DS is a two axes digital output accelerometer that includes a sensing element and an IC interface able to take the information from the sensing element and to provide the measured acceleration signals to the external world through an SPI serial interface.

The sensing element, capable of detecting the acceleration, is manufactured using a dedicated process developed by ST to produce inertial sensors and actuators in silicon.

The IC interface instead is manufactured using a CMOS process that allows high level of integration to design a dedicated circuit which is factory trimmed to better match the sensing element characteristics.

The AIS226DS has a user selectable full scale of ±2 *g*, ±6 *g* and it is capable of measuring acceleration over a bandwidth of 640 Hz for all axes. The device bandwidth may be selected accordingly to the application requirements. The self-test capability allows the user to check the functioning of the system.

The device is available in plastic SOIC package 300mils reverse frame forming for EMI reduction and it is specified over a temperature range extending from -40 °C to +105 °C.

The AIS226DS may be used in non-safety automotive applications, such as:

- Anti-theft systems and inertial navigation
- Motion activated functions
- Vibration monitoring and compensation
- Tilt measurements
- Black boxes, event recorders

a. I^2C interface is also available.

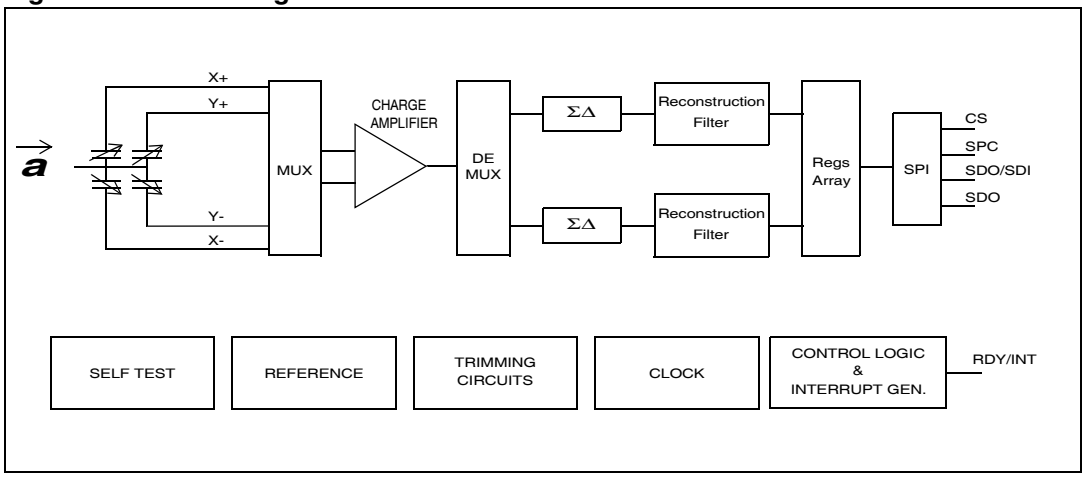
Table 1. Device summary

Order code	Operating temperature range [° C]	Package	Packing
AIS226DS	-40 to +105	SO16W	Tray
AIS226DSTR	-40 to +105	SO16W	Tape and reel

1 Block diagram and pin description

1.1 Block diagram

Figure 1. Block diagram



1.2 SO16W pin description

Figure 2. Pin connection

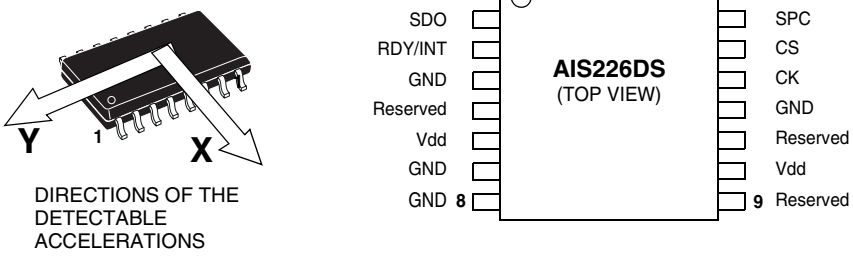


Table 2. Pin description

Pin#	Name	Function
1	SDI/ SDO	SPI serial data input (SDI) 3-wire Interface Serial Data Output (SDO)
2	SDO	SPI serial data output
3	RDY/INT	Data ready/inertial wake-up and free-fall interrupt
4	GND	0 V supply
5	Reserved	Either leave unconnected or connect to GND
6	Vdd	Power supply
7	GND	0 V supply
8	GND	0 V supply
9	Reserved	Connect to Vdd
10	Vdd	Power supply
11	Reserved	Either leave unconnected or connect to Vdd_IO
12	GND	0 V supply
13	CK	Optional external clock, if not used either leave unconnected or connect to GND
14	CS	Chip select (logic 0: SPI enabled, logic 1: SPI disabled)
15	SPC	SPI serial port clock
16	Vdd_IO	Power supply for I/O pads

2 Mechanical and electrical specifications

2.1 Mechanical characteristics

Table 3. Mechanical characteristics @ Vdd = 3.3 V, T = -40 °C to 105 °C unless otherwise noted(1)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
FS	Measurement range	FS bit set to 0		±2.0		g
		FS bit set to 1		±6.0		
Dres	Device resolution	Full-scale = ±2 *g* T = 25 °C, ODR1=40 Hz		1.0		mg
		Full-scale = ±2 *g* T = 25 °C, ODR2=160 Hz		2.0		
		Full-scale = ±2 *g* T = 25 °C, ODR3 = 640 Hz		3.9		
		Full-scale = ±2 *g* T = 25 °C, ODR4 = 2560 Hz		15.6		
So	Sensitivity	Full-scale = ±2 *g* 14 bit representation		4096		LSb/g
		Full-scale = ±6 *g* 14 bit representation(2)		1360		
TCSo	Sensitivity change vs temperature	Full-scale = ±2 *g*		0.025		%/°C
Off	Zero-g level offset accuracy(3),(4)	Full-scale = ±2 *g*	TBD		TBD	mg
		Full-scale = ±6 *g*(2)	TBD		TBD	
TCOff	Zero-g level change vs temperature	Max delta from 25 °C		TBD		mg/°C
NL	Non linearity(2)	Best fit straight line Full-scale = ±2 *g* ODR = 40 Hz		±2		% FS
CrAx	Cross axis(2)			±3		%
V_{st}	Self-test output change(5),(6)	Full-scale= ±2 *g*		840		LSb
		Full-scale= ±6 *g*		280		LSb
BW	System bandwidth			ODRx/4		Hz
T_{OP}	Operating temperature range		-40		+105	°C

1. The product is factory calibrated at 3.3 V. Operation over 3.6 V might affect the reliability of the device
2. Guaranteed by design
3. Zero-g level offset value after MSL3 preconditioning
4. Offset can be eliminated by enabling the built-in high pass filter (HPF)
5. Self test output changes with the power supply. “Self-test output change” is defined as $OUTPUT[LSb]_{(Self\text{-}test\ bit\ on\ CTRL\_REG1=1)}$ - $OUTPUT[LSb]_{(Self\text{-}test\ bit\ on\ CTRL\_REG1=0)}$. 1LSb = 1g/4096 at 14 bit representation, 2 g Full-scale
6. Output data reach 99% of final value after 5/ODR when enabling Self-test mode due to device filtering

2.2 Electrical characteristics

Table 4. Electrical characteristics @ Vdd=3.3 V, T = -40 °C to 105 °C unless otherwise noted(1)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
Vdd	Supply voltage		3.0	3.3	3.6	V
Vdd_IO	I/O pads supply voltage(2)		1.71		Vdd	V
Idd	Supply current	Vdd = 3.3 V		0.6		mA
IddPdn	Current consumption in Power-down mode			2		µA
ODR1	Output data rate 1	Dec factor = 512		40		Hz
ODR2	Output data rate 2	Dec factor = 128		160		
ODR3	Output data rate 3	Dec factor = 32		640		
ODR4	Output data rate 4	Dec factor = 8		2560		
BW	System bandwidth(3)			ODRx/4		Hz
Ton	Turn-on time(4)			5/ODRx		s
T_{OP}	Operating temperature range		-40		+105	°C

1. The product is factory calibrated at 3.3 V. Operation over 3.6 V might affect the reliability of the device
2. Guaranteed by design
3. Digital filter -3 dB frequency
4. Time to obtain valid data after exiting power-down mode

3 Package information

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second Level Interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK® is an ST trademark.

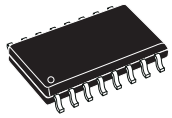
ECOPACK® specifications are available at: www.st.com.

Figure 3. SO16W mechanical data and package dimensions

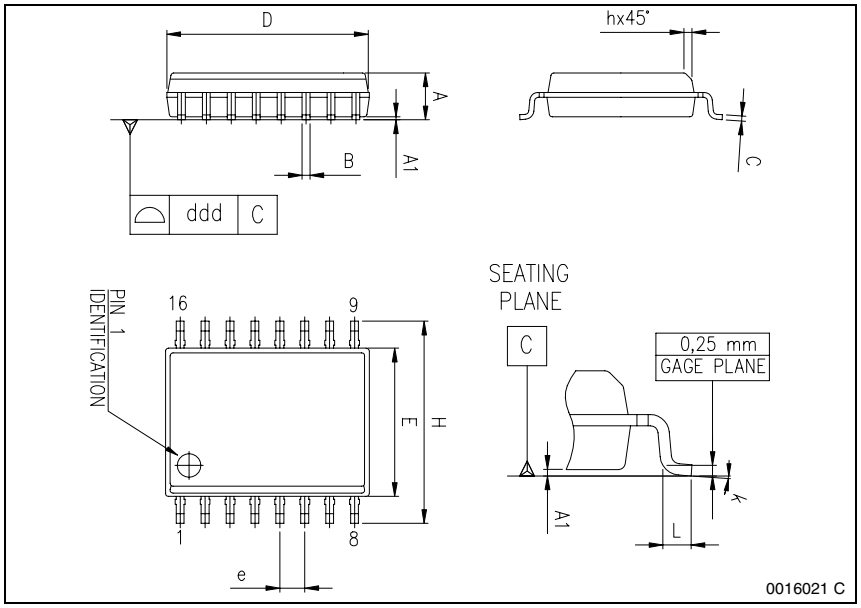
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.35		2.65	0.093		0.104
A1	0.10		0.30	0.004		0.012
B	0.33		0.51	0.013		0.200
C	0.23		0.32	0.009		0.013
D (1)	10.10		10.50	0.398		0.413
E	7.40		7.60	0.291		0.299
e		1.27			0.050	
H	10.0		10.65	0.394		0.419
h	0.25		0.75	0.010		0.030
L	0.40		1.27	0.016		0.050
k	0° (min.), 8° (max.)					
ddd			0.10			0.004

(1) "D" dimension does not include mold flash, protusions or gate burrs. Mold flash, protusions or gate burrs shall not exceed 0.15mm per side.

OUTLINE AND MECHANICAL DATA



SO16 (Wide)



4 Revision history

Table 5. Document revision history

Date	Revision	Changes
13-Nov-2008	1	Initial release.

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