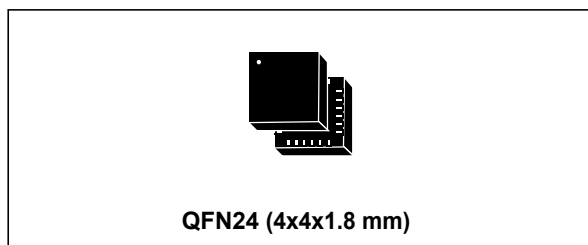


High-performance motion sensor for automotive applications: ultra-low-power digital output 3-axis accelerometer

Data brief



Features

- Wide supply voltage range, 2.4 V to 3.6 V
- 1.8 V low-voltage-compatible IOs
- Ultra-low-power mode consumption down to 10 μ A
- $\pm 6g/\pm 12g/\pm 24g$ dynamically selectable full scales
- SPI/I²C digital output interface
- 16-bit data output, 12-bit resolution
- 2 independent programmable interrupt generators
- System sleep-to-wakeup function
- Embedded self-test
- Extended temperature range -40 °C to 105 °C
- 10000 g high shock survivability
- ECOPACK[®], RoHS and “Green” compliant (see [Section 3](#))
- AEC-Q100 qualification

Description

The AIS3624DQ is an ultra-low-power high-performance three-axis linear accelerometer with a digital serial interface SPI standard output. An I²C compatible interface is also available.

The device features ultra-low-power operational modes that allow advanced power saving and smart sleep-to-wakeup functions.

The AIS3624DQ has dynamically user-selectable full scales of $\pm 6g/\pm 12g/\pm 24g$ and is capable of measuring accelerations with output data rates from 0.5 Hz to 1 kHz.

The self-test capability allows the user to check the functioning of the sensor in the final application.

The device may be configured to generate an interrupt signal by inertial wakeup/free-fall events as well as by the position of the device itself. Thresholds and timing of interrupt generators are programmable by the end user on the fly.

The AIS3624DQ is available in a small quad flat no-lead (QFN) package (4x4 mm footprint) and is guaranteed to operate over an extended temperature range from -40 °C to +105 °C.

This product may be used in a variety of automotive non-safety applications such as:

- Motion-activated functions
- Telematic boxes
- Impact recognition and logging
- Vibration monitoring and compensation

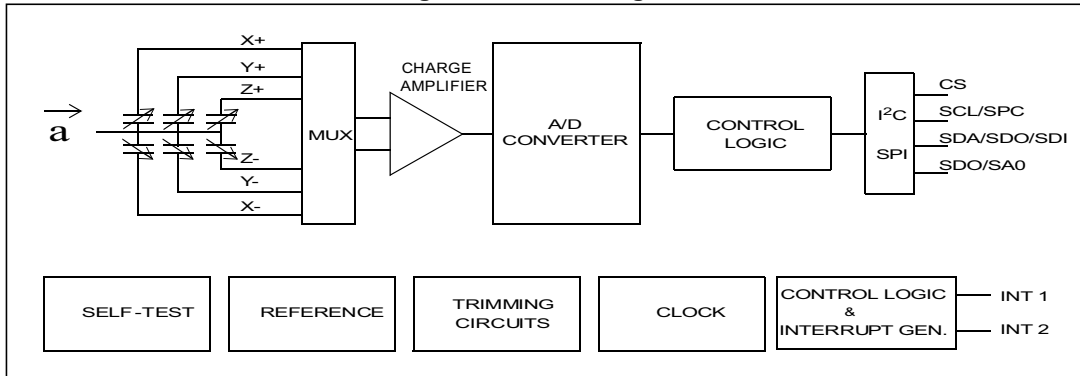
Table 1. Device summary

Order codes	Temperature range [°C]	Package	Packaging
AIS3624DQ	-40 to +105	QFN24 4x4x1.8 mm	Tray
AIS3624DQTR	-40 to +105	QFN24 4x4x1.8 mm	Tape and reel

1 Block diagram and pin description

1.1 Block diagram

Figure 1. Block diagram



1.2 Pin description

Figure 2. Pin connections

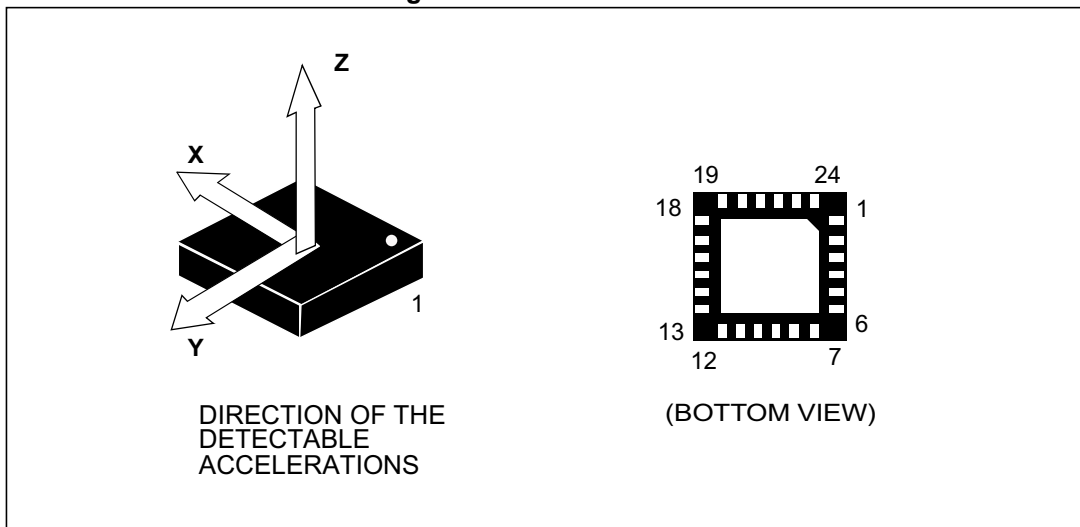


Table 2. Pin description

Pin#	Name	Function
1,2	NC	Not connected
3	INT_2	Inertial interrupt 2
4	Reserved	Connect to GND
5	VDD	Power supply
6	GND	0 V supply
7	INT_1	Inertial interrupt 1
8	GND	0 V supply
9	GND	0 V supply
10	GND	0 V supply
11	SPC SCL	SPI serial port clock (SPC) I ² C serial clock (SCL)
12	CS	SPI enable I ² C/SPI mode selection (0: SPI enabled; 1: I ² C mode)
13	Reserved	Connect to Vdd
14	VDD_IO	Power supply for I/O pins
15	SDO SA0	SPI serial data output (SDO) I ² C less significant bit of the device address (SA0)
16	SDI SDO SDA	SPI serial data input (SDI) 3-wire interface serial data output (SDO) I ² C serial data (SDA)
17-24	NC	Not internally connected

2 Mechanical and electrical specifications

2.1 Mechanical characteristics

@ Vdd = 3.3 V, T = -40 °C to +105 °C unless otherwise noted^(a)

Table 3. Mechanical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
FS	Measurement range ⁽¹⁾	FS bit set to 00		±6		g
		FS bit set to 01		±12		
		FS bit set to 11		±24		
So	Sensitivity	FS bit set to 00 12-bit representation		2.9		mg/digit
		FS bit set to 01 12-bit representation		5.9		
		FS bit set to 11 12-bit representation		11.7		
TCSO	Sensitivity change vs temperature	FS bit set to 00		±0.01		%/°C
TyOff	Typical zero-g level offset accuracy ^{(2),(3)}	FS bit set to 00		±70		mg
TCOff	Zero-g level change vs. temperature	Max delta from 25 °C		±0.4		mg/°C
An	Acceleration noise density	FS bit set to 00		600		µg/√Hz
Vst	Self-test output change ⁽⁴⁾⁽⁵⁾⁽⁶⁾	FS bit set to 00 X-axis		100		LSb
		FS bit set to 00 Y-axis		100		LSb
		FS bit set to 00 Z-axis		120		LSb
Top	Operating temperature range		-40		+105	°C
Wh	Product weight			55		mgram

1. Verified by wafer level test and measurement of initial offset and sensitivity.
2. Typical zero-g level offset value after MSL3 preconditioning.
3. Offset can be eliminated by enabling the built-in high-pass filter.
4. The sign of "Self-test output change" is defined by a sign bit, for all axes.
5. Self-test output changes with the power supply. "Self-test output change" is defined as $OUTPUT[LSb]_{(CTRL_REG4\ ST\ bit=1)} - OUTPUT[LSb]_{(CTRL_REG4\ ST\ bit=0)}$. 1LSb=12g/4096 at 12-bit representation, ±6 g full-scale.
6. Output data reach 99% of final value after 1/ODR+1ms when enabling self-test mode due to device filtering.

a. The product is factory calibrated at 3.3 V. Operational power supply (Vdd) over 3.6 V is not recommended.

2.2 Electrical characteristics

@ Vdd = 3.3 V, T = -40°C to +105°C unless otherwise noted^(b)

Table 4. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
Vdd	Supply voltage		2.4		3.6	V
Vdd_IO	I/O pins supply voltage ⁽¹⁾		1.71		Vdd+0.1	V
Idd	Current consumption in normal mode			250		μA
IddLP	Current consumption in low-power mode			10		μA
IddPdn	Current consumption in power-down mode			1		μA
VIH	Digital high-level input voltage		0.8*Vdd_IO			V
VIL	Digital low-level input voltage				0.2*Vdd_IO	V
VOH	High-level output voltage		0.9*Vdd_IO			V
VOL	Low-level output voltage				0.1*Vdd_IO	V
ODR	Output data rate in normal mode	DR bit set to 00		50		Hz
		DR bit set to 01		100		
		DR bit set to 10		400		
		DR bit set to 11		1000		
ODR _{LP}	Output data rate in low-power mode	PM bit set to 010		0.5		Hz
		PM bit set to 011		1		
		PM bit set to 100		2		
		PM bit set to 101		5		
		PM bit set to 110		10		
BW	System bandwidth			ODR/2		Hz
Ton	Turn-on time ⁽²⁾	ODR = 100 Hz		1/ODR+ 1ms		s
Top	Operating temperature range		-40		+105	°C

1. It is possible to remove Vdd maintaining Vdd_IO without blocking the communication busses. In this condition the measurement chain is powered off.

2. Time to obtain valid data after exiting power-down mode

b. The product is factory calibrated at 3.3 V. Operational power supply (Vdd) over 3.6 V is not recommended.

2.3 Absolute maximum ratings

Stresses above those listed as “absolute maximum ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device under these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

Table 5. Absolute maximum ratings

Symbol	Ratings	Maximum value	Unit
V _{dd}	Supply voltage	-0.3 to 4	V
V _{dd_IO}	I/O pins supply voltage	-0.3 to V _{dd} +0.1	V
V _{in}	Input voltage on any control pin (CS, SCL/SPC, SDA/SDI/SDO, SDO/SA0)	-0.3 to V _{dd_IO} +0.3	V
A _{POW}	Acceleration (any axis, powered, V _{dd} = 2.5 V)	3000 g for 0.5 ms	
		10000 g for 0.1 ms	
A _{UNP}	Acceleration (any axis, unpowered)	3000 g for 0.5 ms	
		10000 g for 0.1 ms	
T _{OP}	Operating temperature range	-40 to +105	°C
T _{STG}	Storage temperature range	-40 to +125	°C
ESD	Electrostatic discharge protection	2 (HBM)	kV
		500 (CDM)	V
		200 (MM)	V

Note: Supply voltage on any pin should never exceed 4.0 V



This device is sensitive to mechanical shock, improper handling can cause permanent damage to the part.

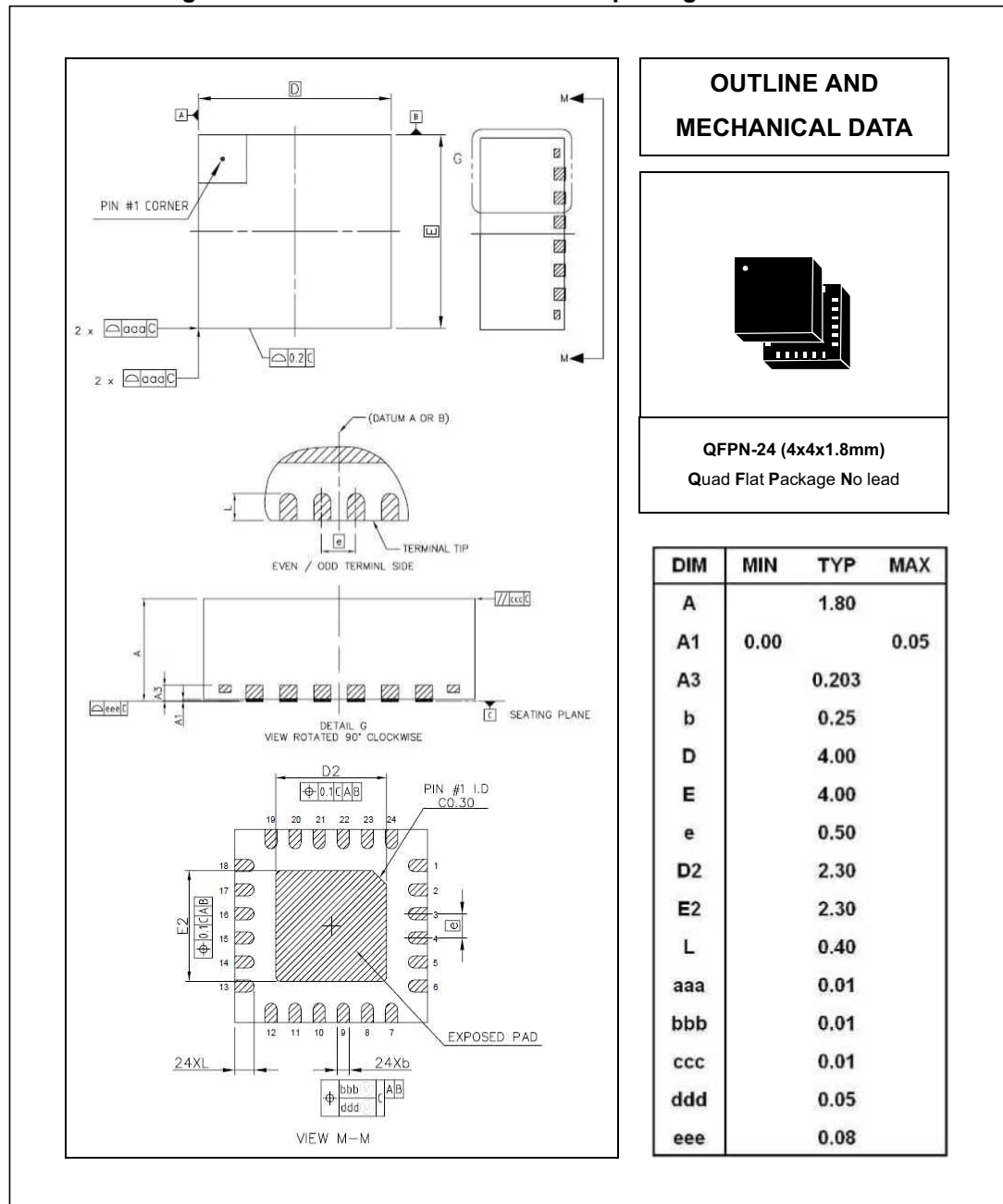


This device is sensitive to electrostatic discharge (ESD), improper handling can cause permanent damage to the part.

3 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

Figure 3. QFN24: Mechanical data and package dimensions



4 Revision history

Table 6. Document revision history

Date	Revision	Changes
06-May-2014	1	Initial release

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