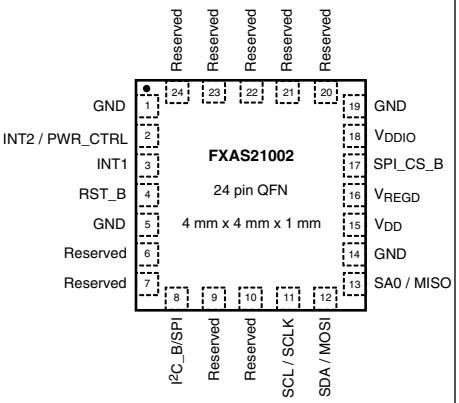
Xtrinsic 3-Axis Digital Angular Rate Gyroscope

FXAS21002

24 QFN
4 mm x 4 mm x 1 mm
Case 2209-01



Pin Connections

FXAS21002 is a small, low-power, yaw, pitch, and roll angular rate gyroscope. The full-scale range is adjustable from ±250°/s to ±2000°/s. It features both I^2C and SPI interfaces.

FXAS21002 is capable of measuring angular rates up to ±2000°/s, with output data rates (ODR) from 12.5 to 800 Hz. An integrated Low-Pass Filter (LPF) allows the host application to limit the digital signal bandwidth and noise. The device may be configured to generate an interrupt when a user-programmable angular rate threshold is crossed on any one of the enabled axes.

FXAS21002 is available in a plastic, 24-lead QFN package; the device is guaranteed to operate over the extended temperature range of –40 °C to +85 °C.

Features

- V_{DD} supply voltage from 1.95 V to 3.6 V; digital interface supply voltage from 1.62 V to 3.6 V
- 16-bit digital output resolution
- ±250/500/1000/2000°/s software-selectable full-scale dynamic ranges
- Noise density of 25 mdps/√Hz at 100 Hz bandwidth (200 Hz ODR)
- Current consumption in Active mode is ≤ 3 mA
- Time to transition from Standby to Active mode is ≤ 50 ms
- Interfaces:
  - I^2C Normal-mode (100 kHz)
  - I^2C Fast-mode (400 kHz)
  - I^2C Fast-mode Plus (1 MHz)
  - SPI 3-wire (up to 2 MHz)
  - SPI 4-wire (up to 2 MHz)
- FIFO buffer is 192 bytes deep (32 X/Y/Z samples) with stop, circular and triggered operating modes
- Output data rates (ODR) from 12.5 to 800 Hz; programmable low-pass filter to further limit digital output data bandwidth
- Angular rate sensitivity of 0.061°/s in ±2000°/s FSR mode
- Low power standby mode
- Power mode transition control via external pin for accelerometer-based power management (motion interrupt)
- Rate threshold interrupt
- Integrated self-test function
- No external charge-pump capacitor needed
- 8-bit temperature sensor
- MSL 3 compliant package

Preliminary
Non-Disclosure Agreement required

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Table of Contents

1 Typical Applications

- Game controller
- Gyro stabilized electronic compass
- Orientation determination
- Gesture-based user interfaces
- Indoor navigation
- Human machine interface
- Mobile phones
- Toy helicopter
- Virtual and augmented reality devices (including glasses)

2 General Description

2.1 Block Diagram

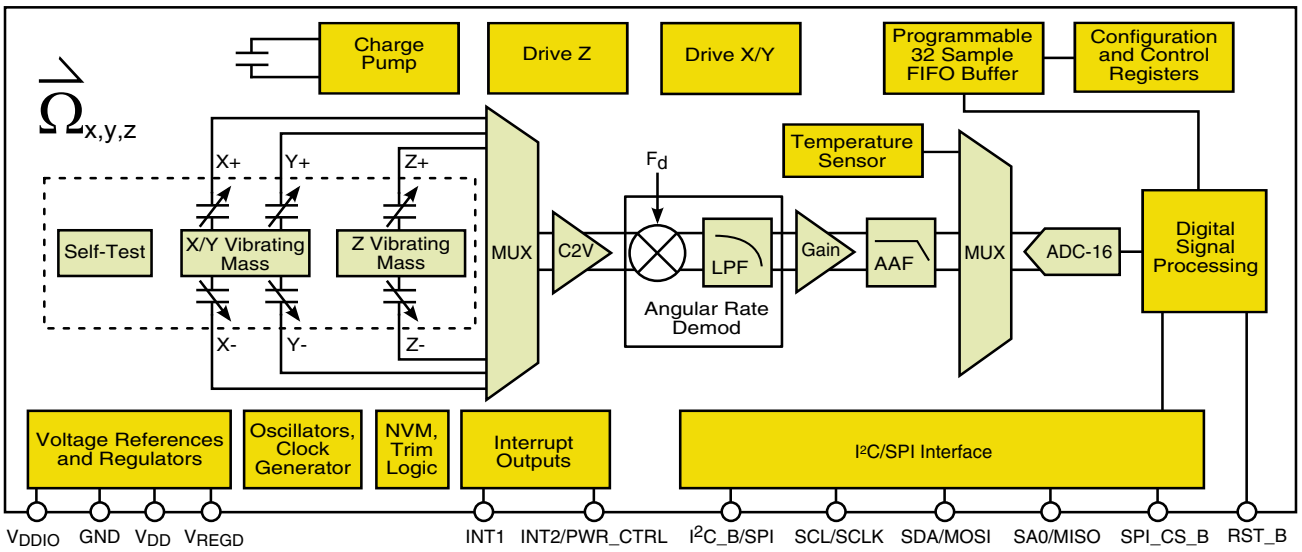


Figure 1. Block Diagram

2.2 Pinout

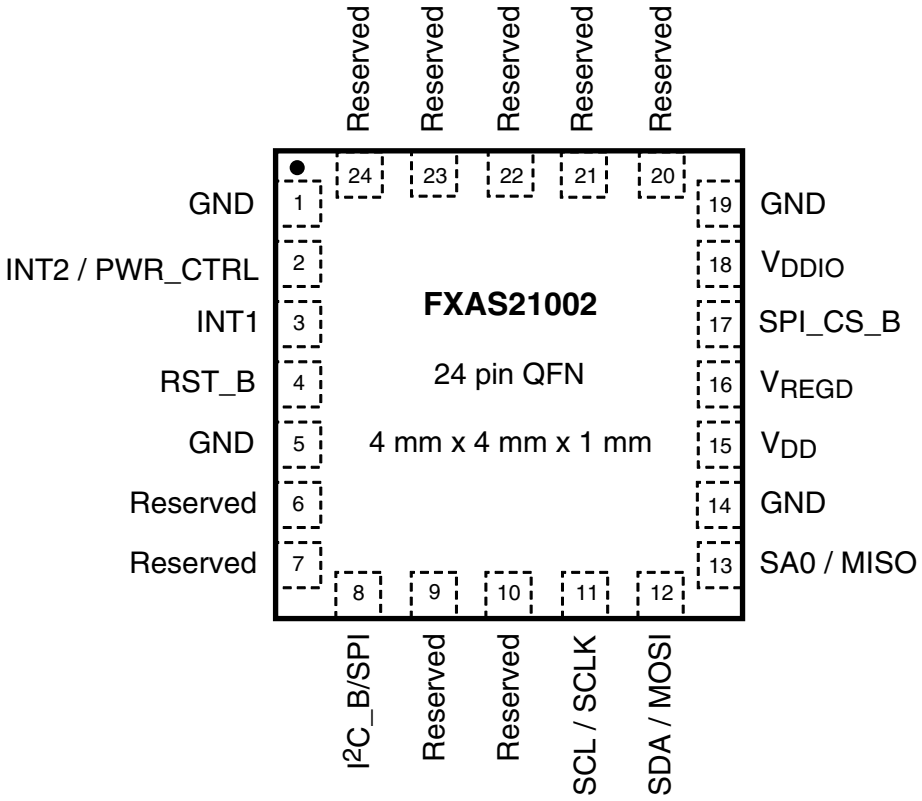


Figure 2. Device pinout (top view)

Table 1. Pin functions

Pin	Name	Function
1	GND	Ground
2	INT2/PWR_CTRL	Interrupt Output 2 / Power state transition control input
3	INT1	Interrupt Output 1
4	RST_B	Reset input (active low, connect to V_{DDIO} if unused)
5	GND	Ground
6	Reserved	Reserved - Must be tied to ground
7	Reserved	Reserved - Must be tied to ground
8	I^2C_B/SPI	Digital interface selection pin – must be tied either high or low to select either SPI or I^2C interface mode, respectively
9	Reserved	Reserved - Must be tied to ground
10	Reserved	Reserved - Must be tied to ground
11	SCL/SCLK	I^2C / SPI clock
12	SDA/MOSI/SPI_DIO	I^2C data / SPI 4-wire Master Out Slave In / SPI 3-wire data In/Out[1]
13	SA0/MISO	I^2C address bit0 / SPI 4-wire Master In Slave Out
14	GND	Ground

Table continues on the next page...

Table 1. Pin functions (continued)

Pin	Name	Function
15	V_{DD}	Supply voltage
16	V_{REGD}	Digital regulator output. Please connect a 0.1 uF capacitor between this pin and GND
17	SPI_CS_B	SPI chip select input, active low. This pin must be held logic high when operating in I^2C interface mode (I^2C/SPI_CS_B set high) to ensure correct operation.
18	V_{DDIO}	Interface supply voltage
19	GND	Ground
20	Reserved	Reserved - Must be tied to ground
21	Reserved	Reserved - Must be tied to ground
22	Reserved	Reserved - Must be tied to ground
23	Reserved	Reserved - Must be tied to ground
24	Reserved	Reserved - Must be tied to ground

1. MOSI becomes a bidirectional data pin when FXAS21002 is operated in 3-wire SPI mode with CTRL_REG0[SPIW]=1.

2.3 System Connections

The FXAS21002 offers the choice of connecting to a host processor through either I^2C or SPI interfaces. Figure 3 and Figure 4 show the recommended circuit connections for implementing both options.

2.3.1 Typical Application Circuit—I²C Mode

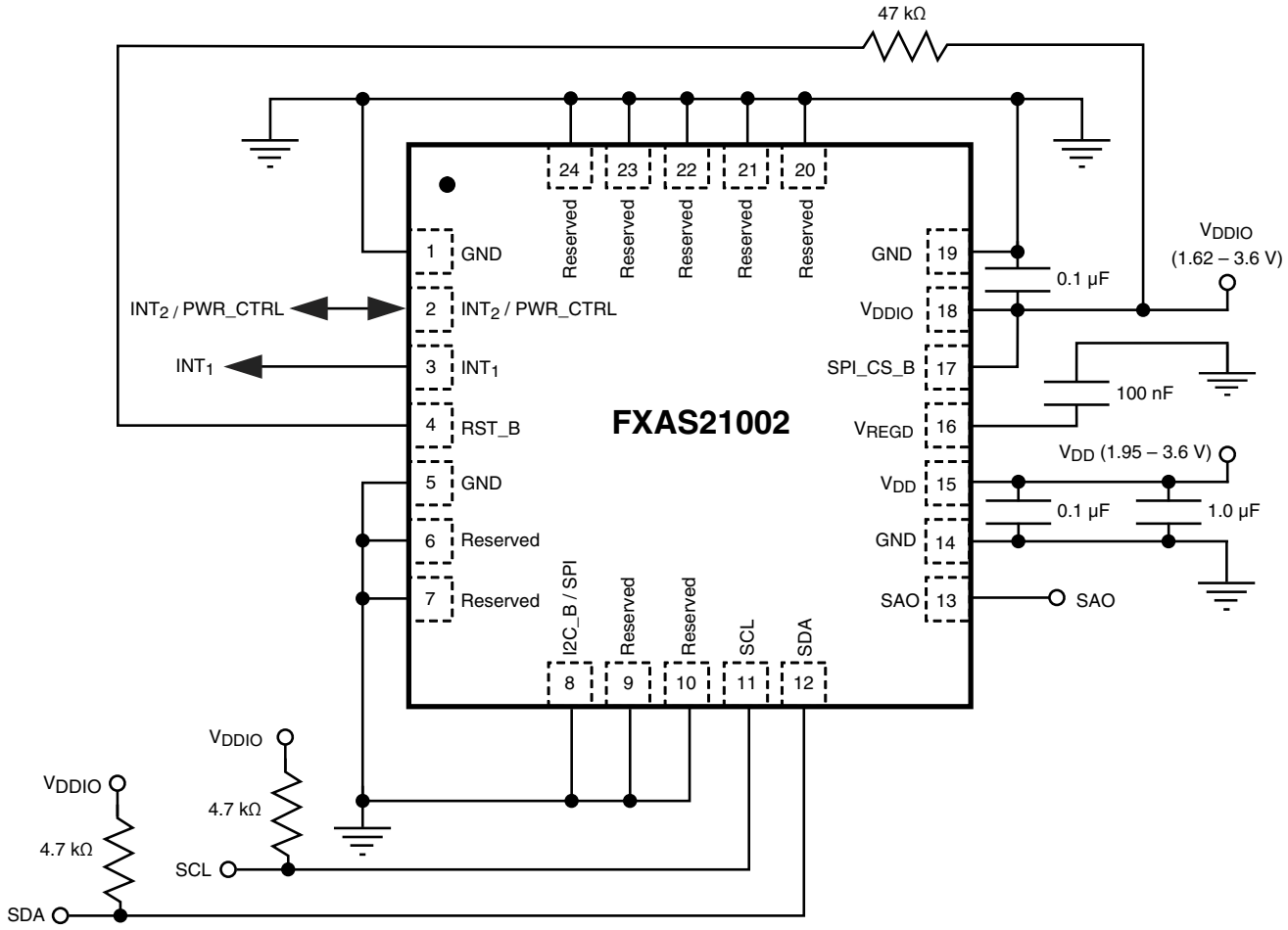


Figure 3. I²C mode electrical connections

2.3.2 Typical Application Circuit—SPI Mode

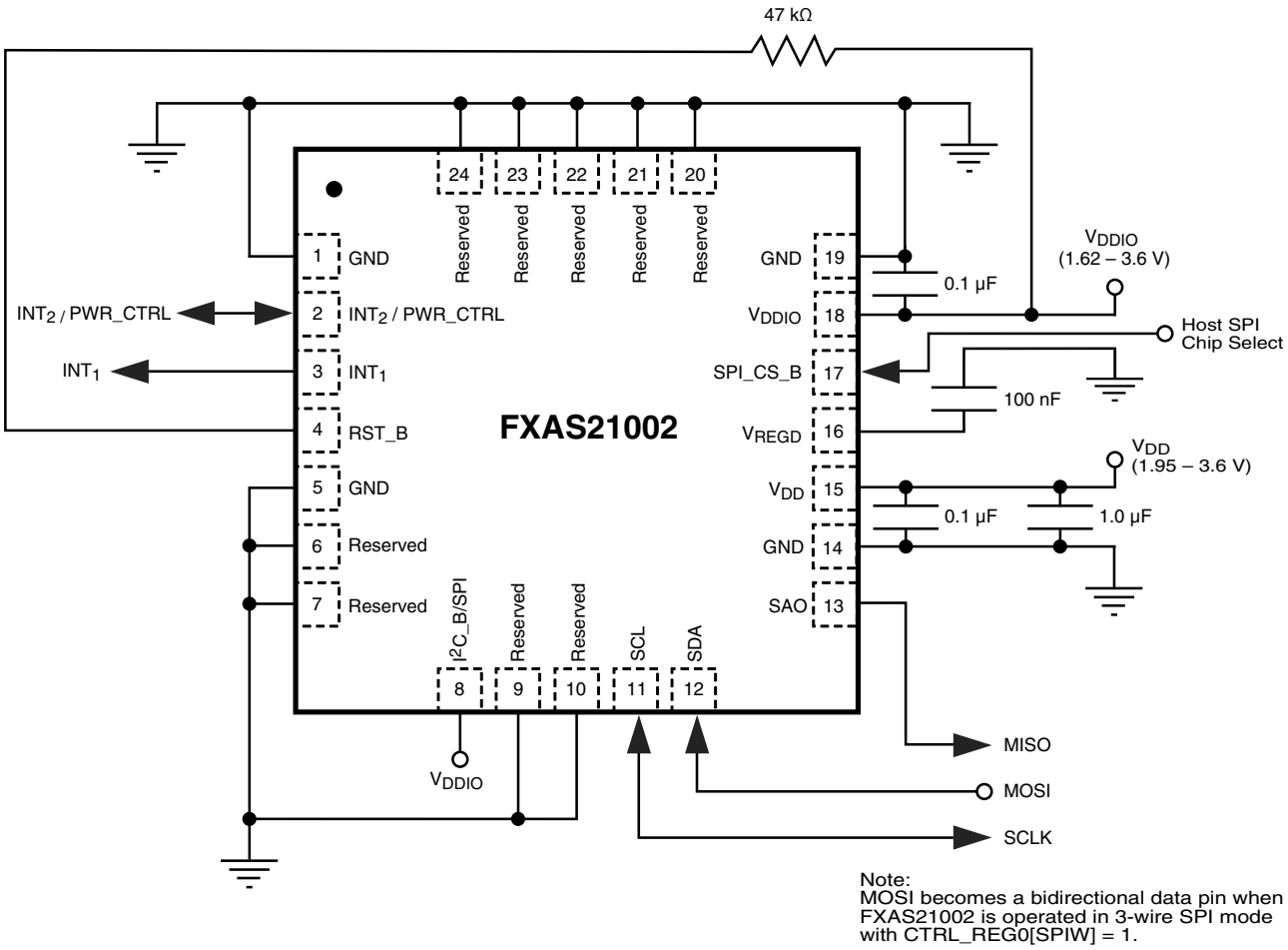


Figure 4. SPI mode electrical connections

2.4 Sensing Direction

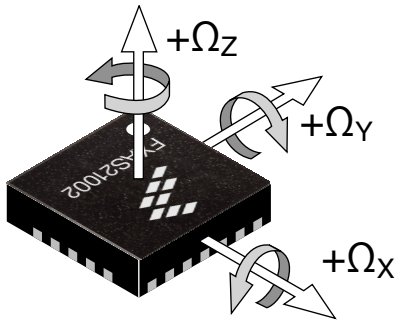
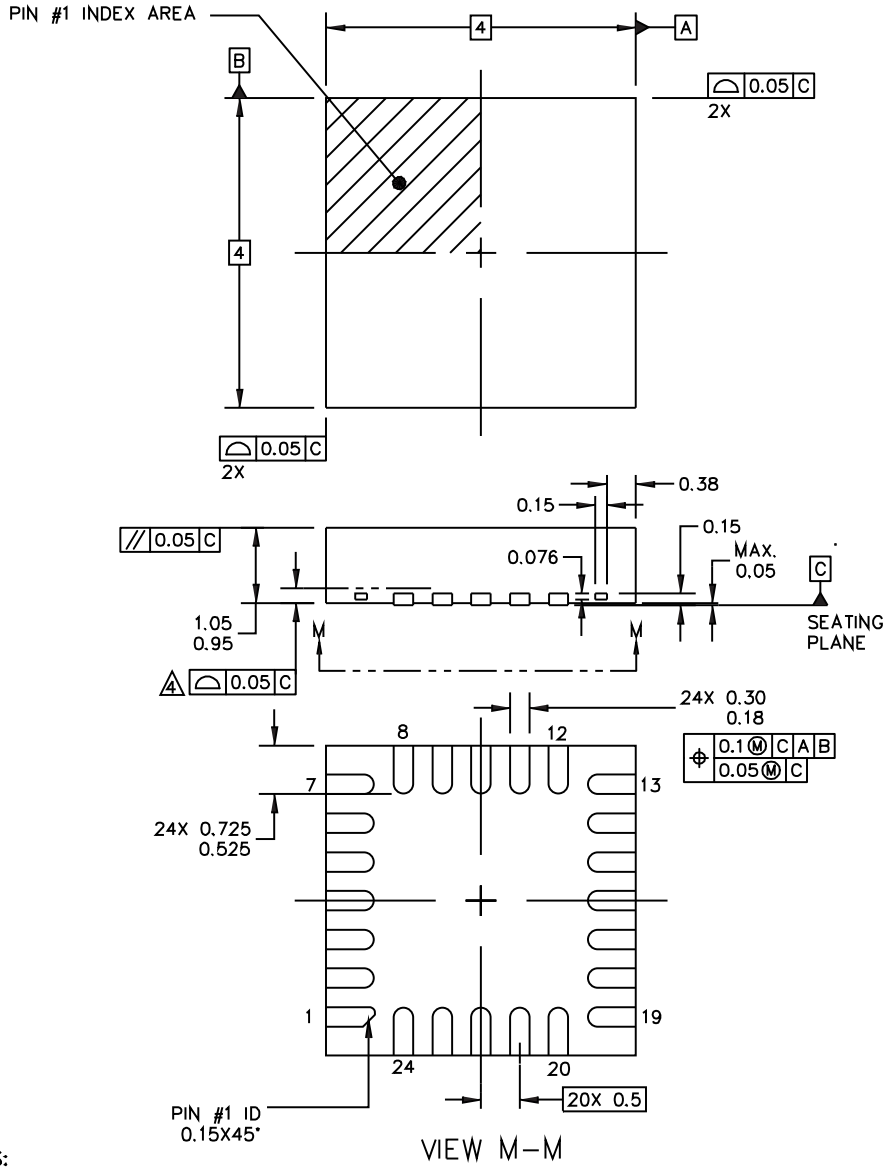


Figure 5. Reference frame for rotational measurement

3 Package Description



NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
3. THIS IS A NON-JEDEC REGISTERED PACKAGE.
4. COPLANARITY APPLIES TO LEADS AND DIE ATTACH FLAG.
5. MIN. METAL GAP SHOULD BE 0.2 MM.

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TITLE: QFN, CHIP ON LEAD (COL), 4 X 4 X 1, 0.5 PITCH, 24 TERMINAL	DOCUMENT NO: 98ASA00356D	REV: O
	CASE NUMBER: 2209-01	15 DEC 2011
	STANDARD: NON-JEDEC	

This drawing is located at freescale.com.

4 Revision History

Revision number	Revision date	Description
0.3	3/2014	Initial release of document

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