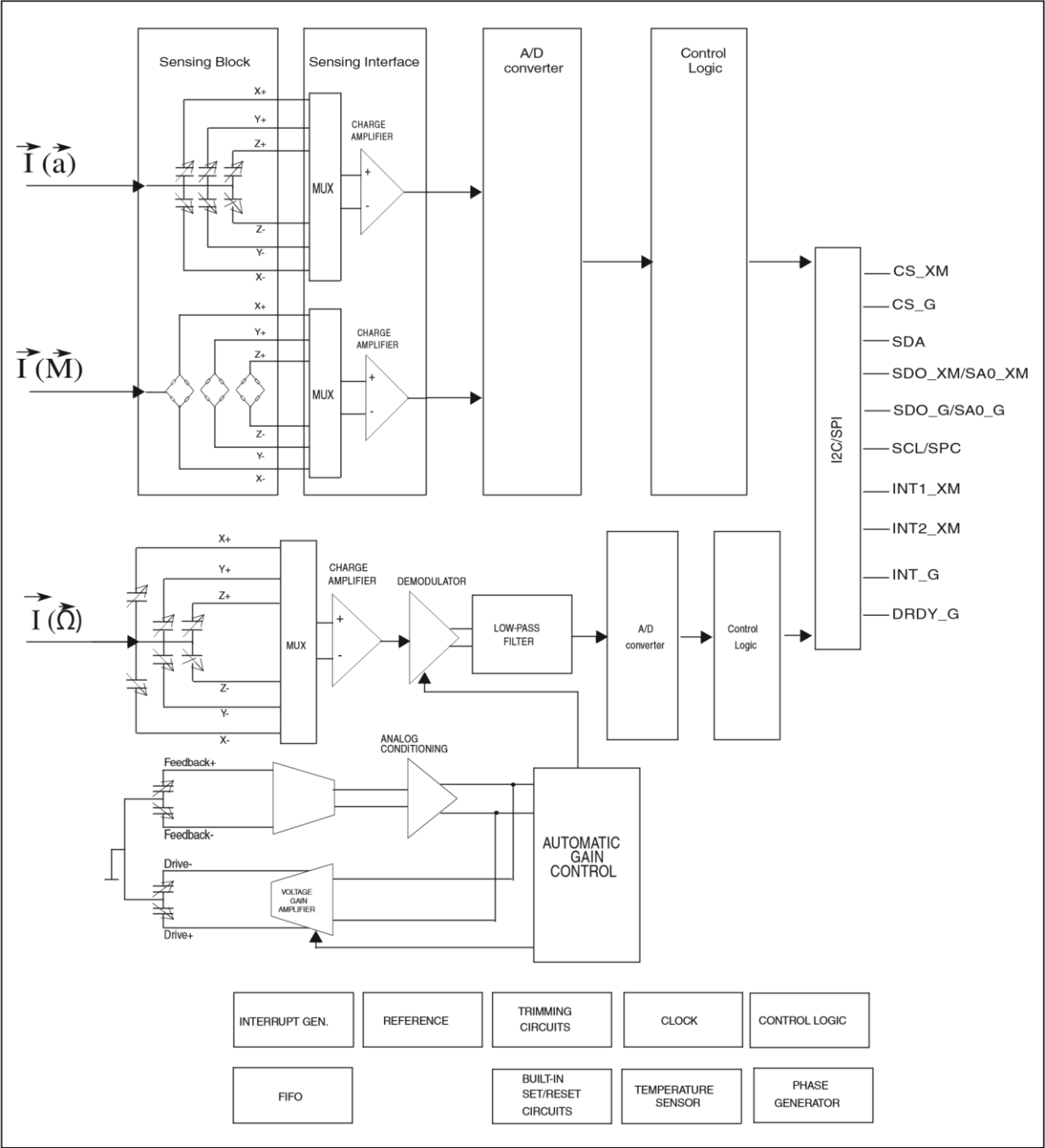


1 Block diagram and pin description

1.1 Block diagram

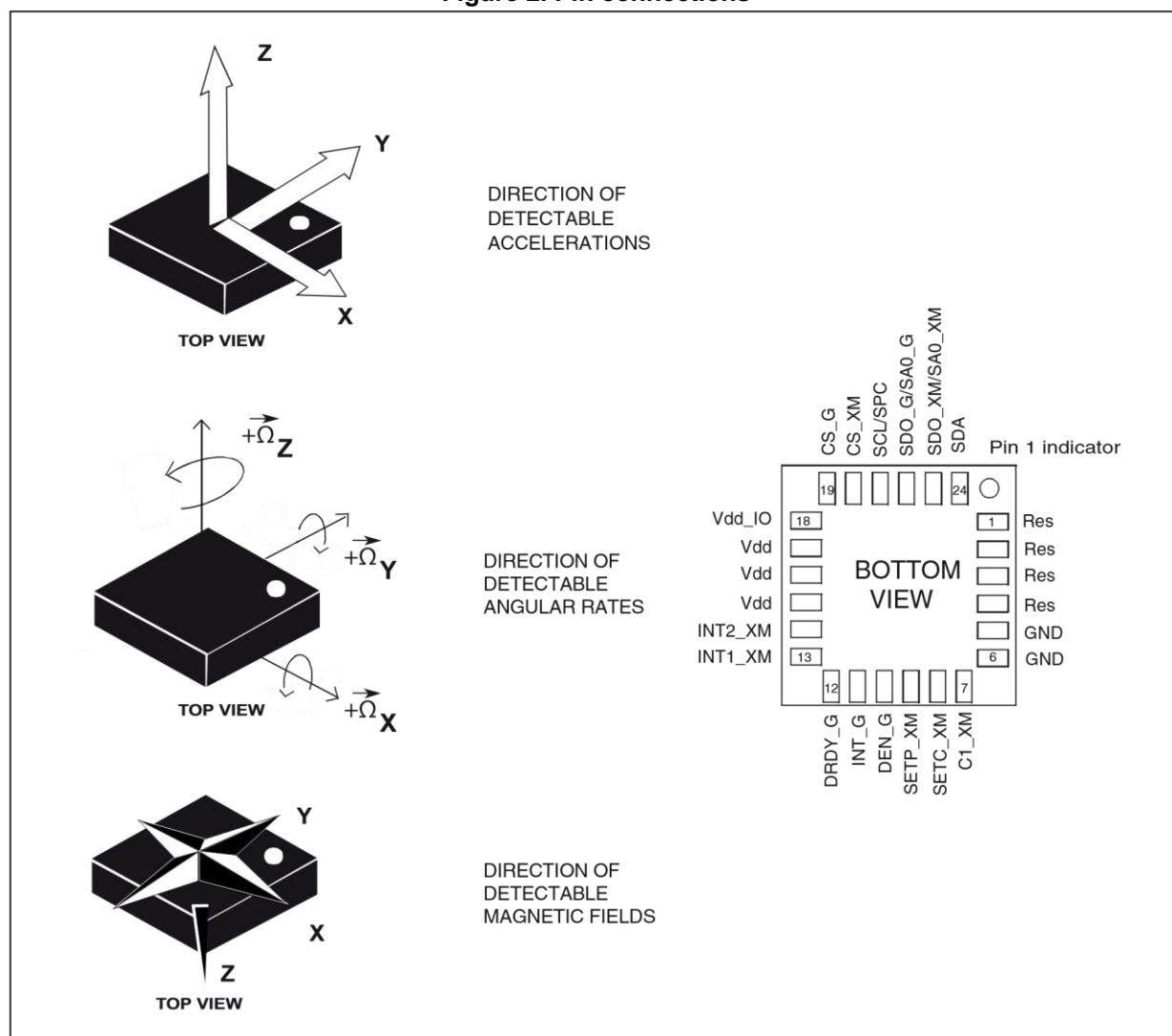
Figure 1. Block diagram



Block diagram and pin description

## 1.2 Pin description

Figure 2. Pin connections



Block diagram and pin description

Table 2. Pin description

Pin#	Name	Function
1	Reserved	Leave unconnected
2	Reserved	Connect to GND
3	Reserved	Connect to GND
4	Reserved	Connect to GND
5	GND	0 V supply
6	GND	0 V supply

7	C1_XM	Capacitor connection (C1)
8	SETC_XM	S/R capacitor connection (C2)
9	SETP_XM	S/R capacitor connection (C2)
10	DEN_G	Gyroscope data enable
11	INT_G	Gyroscope programmable interrupt
12	DRDY_G	Gyroscope data ready
13	INT1_XM	Accelerometer and magnetic sensor interrupt 1
14	INT2_XM	Accelerometer and magnetic sensor interrupt 2
15	Vdd	Power supply
16	Vdd	Power supply
17	Vdd	Power supply
18	Vdd_IO	Power supply for I/O pins
19	CS_G	Gyroscope I <sup>2</sup> C/SPI mode selection 1: SPI idle mode / I <sup>2</sup> C communication enabled 0: SPI communication mode / I <sup>2</sup> C disabled
20	CS_XM	Accelerometer and magnetic sensor SPI enabled I <sup>2</sup> C/SPI mode selection 1: SPI idle mode / I <sup>2</sup> C communication enabled 0: SPI communication mode / I <sup>2</sup> C disabled
21	SCL SPC	I <sup>2</sup> C serial clock (SCL) SPI serial port clock (SPC)
22	SDO_G SA0_G	Gyroscope serial data output (SDO) Angular rate sensor I <sup>2</sup> C less significant bit of the device address (SA0)
23	SDO_XM SA0_XM	Accelerometer and magnetic sensor SPI serial data output (SDO) Accelerometer and magnetic sensor I <sup>2</sup> C less significant bit of the device address (SA0)
24	SDA	I <sup>2</sup> C serial data (SDA)

## 2 Module specifications

### 2.1 Sensor characteristics

@ Vdd = 3.0 V, T = 25 °C unless otherwise noted<sup>(a)</sup>

**Table 3. Sensor characteristics**

Symbol	Parameter	Test conditions	Min.	Typ. <sup>(1)</sup>	Max.	Unit
LA_FS	Linear acceleration measurement range <sup>(2)</sup>			±2		g
				±4		
				±6		
				±8		
				±16		
M_FS	Magnetic measurement range			±2		gauss
				±4		
				±8		
				±12		
G_FS	Angular rate measurement range			±245		dps
				±500		
				±2000		
LA_So	Linear acceleration sensitivity	Linear acceleration FS = ±2 g		0.061		mg/LSB
		Linear acceleration FS = ±4 g		0.122		
		Linear acceleration FS = ±6 g		0.183		
		Linear acceleration FS = ±8 g		0.244		
		Linear acceleration FS = ±16 g		0.732		
M_GN	Magnetic sensitivity	Magnetic FS = ±2 gauss		0.08		mgauss/ LSB
		Magnetic FS = ±4 gauss		0.16		
		Magnetic FS = ±8 gauss		0.32		
		Magnetic FS = ±12 gauss		0.48		
G_So	Angular rate sensitivity	Angular rate FS = ±245 dps		8.75		mdps/ digit
		Angular rate FS = ±500 dps		17.50		

		Angular rate FS = $\pm 2000$ dps		70		
LA_TCSO	Linear acceleration sensitivity change vs. temperature	From -40 °C to +85 °C		$\pm 1.5$		%
M_TCSO	Magnetic sensitivity change vs. temperature	From -40 °C to +85 °C		$\pm 3$		%

a. The product is factory calibrated at 3.0 V. The operational power supply range is from 2.4 V to 3.6 V.

**Table 3. Sensor characteristics (continued)**

Symbol	Parameter	Test conditions	Min.	Typ. <sup>(1)</sup>	Max.	Unit
G_SoDr	Angular rate sensitivity change vs. temperature	From -40 °C to +85 °C		$\pm 2$		%
LA_TyOff	Linear acceleration typical zero-g level offset accuracy <sup>(3)(4)</sup>			$\pm 60$		mg
G_TyOff	Angular rate typical zero-rate level	FS = 245 dps		$\pm 10$		dps
		FS = 500 dps		$\pm 15$		
		FS = 2000 dps		$\pm 25$		
LA_TCOff	Linear acceleration zero-g level change vs. temperature	Max delta from 25 °C		$\pm 0.5$		mg/°C
G_TCOff	Zero-rate level change vs. temperature			$\pm 0.05$		dps/°C
M_EF	Maximum exposed field	No perming effect on zero reading			10000	gauss
M_DF	Magnetic disturbing field	Sensitivity starts to degrade. Automatic S/R pulse restores the sensitivity <sup>(5)</sup>			20	gauss
LA_ST	Linear acceleration self-test positive difference <sup>(6)(7)</sup>	$\pm 2$ g range, X, Y, Z-axis AST1:0 = 01 see <a href="#">Table 74</a>	60		1700	mg
G_ST	Angular rate self-test output change <sup>(8)(9)</sup>	FS = 245 dps	20		250	dps
		FS = 500 dps	70		400	
		FS = 2000 dps	150		1000	
Top	Operating temperature range		-40		+85	°C

1. Typical specifications are not guaranteed
2. Verified by wafer level test and measurement of initial offset and sensitivity
3. Typical zero-g level offset value after MSL3 preconditioning
4. Offset can be eliminated by enabling the built-in high-pass filter
5. Set / Reset Pulse is automatically applied at each conversion cycle

6. "Self-test output change" is defined as: OUTPUT[mg](CTRL\_REG2\_XM (21h) AST1:0 enabled) -  
OUTPUT[mg](CTRL\_REG2\_XM (21h) AST1:0 disabled)
7. For polarity refer to [Table 77: Self-test mode configuration](#)
8. "Self-test output change" is defined as: OUTPUT[mg](CTRL\_REG4\_G (23h) ST1:0 enabled) -  
OUTPUT[mg](CTRL\_REG4\_G (23h) ST1:0 disabled)
9. For polarity refer to [Table 31: Self-test mode configuration](#)

## 2.2 Temperature sensor characteristics

The electrical characteristics concerning the temperature sensor are given in the table below.

@ Vdd = 3.0 V, T=25 °C unless otherwise noted.

**Table 4. Temperature sensor electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ. <sup>(1)</sup>	Max.	Unit
TSDr	Temperature sensor output change vs. temperature	-		8		LSB/°C
TODR	Temperature refresh rate			M_ODR [2:0] <sup>(2)</sup>		Hz
Top	Operating temperature range		-40		+85	°C

1. Typical specifications are not guaranteed.
2. Refer to [Table 84: Magnetic data rate configuration](#).

## 2.3 Electrical characteristics

@ Vdd = 3.0V, T = 25 °C unless otherwise noted<sup>(b)</sup>

**Table 5. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ. <sup>(1)</sup>	Max.	Unit
Vdd	Supply voltage		2.4		3.6	V
Vdd_IO	Module power supply for I/O		1.71	1.8	Vdd+0.1	
Idd_XM	Current consumption of the accelerometer and magnetic sensor in normal mode <sup>(2)</sup>		HR setting CTRL_REG5_XM (M_RES [1,0]) = 11b, see CTRL_REG5_XM (24h)	350		μA
Idd_G	Gyroscope current consumption in normal mode <sup>(3)</sup>			6.1		mA
Idd_G_LP	Gyroscope supply current in sleep mode <sup>(4)</sup>			2		mA
Idd_Pdn	Current consumption in power-down mode <sup>(5)</sup>			6		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
Top	Operating temperature range		-40		+85	°C

1. Typical specifications are not guaranteed

2. Magnetic sensor setting ODR =6.25 Hz, Accelerometer sensor ODR =50 Hz, gyroscope in power-down mode

3. Accelerometer and magnetic sensor in power-down mode

4. Sleep mode introduces a faster turn-on time compared to power-down mode. Accelerometer and magnetic sensor in power-down mode.

5. Linear accelerometer, magnetic sensor and gyroscope in power-down mode