

Acceleration Sensors

Overview

Freescall's micro-electromechanical systems (MEMS)-based acceleration sensors are designed for end products and embedded systems that require measurement of forces resulting from fall, tilt, motion, positioning, shock or vibration. We offer a broad portfolio of acceleration sensors from 1.5g to 250g for applications ranging from highly sensitive seismic detection to robust collision detection. Target markets include consumer, appliance, automotive, industrial, health care and computer peripherals.

Freescall's acceleration sensors incorporate a surface micromachined structure. The g-cell is coupled with an application-specific integrated circuit (ASIC), which provides the accelerometer with amplification, signal conditioning, low-pass filter and temperature compensation. This two-chip solution serves as a system-in-a-package.

Features

- X, XY, XZ, XYZ and Z axes of sensitivity
- 1.5g–250g for a wide variety of applications
- Sensitivity as high as $\pm 1,200$ mV/g
- Signal conditioned with internal filter
- Calibrated self-test for functional verification
- Linear output
- Ratiometric, ideally suited to interface with analog-to-digital converters
- Hermetically sealed g-cell
- Cost-effective plastic packages in low-dimension land grid array (LGA) Pb-free package (3 mm x 5 mm x 1 mm), quad flat no-lead (QFN) Pb-free package (6 mm x 6 mm x 1.45 mm) or SOIC-16 or 20 with through hole or surface mount available

Device	Acceleration (g)	Sensing Axis	Sensitivity (mV/g)	Rolloff Frequency (Hz)	VDD Supply Voltage (Typ) (V)	Zero g Output (Typ) (V)	Packaging
MMA7360L*	1.5 or 6	XYZ	800 or 200	400/300	3.3	1.65	14-pin LGA
MMA7340L*	3 or 12	XYZ	440 or 110	400/300	3.3	1.65	14-pin LGA
MMA7330L*	4 or 16	XYZ	308 or 77	400/300	2.8	1.4	14-pin LGA
MMA7260Q*	1.5/2/4/6	XYZ	800/600/ 300/200	350/150	3.3	1.65	16-pin QFN
MMA7261Q*	2.5/3.3/ 6.7/10	XYZ	480/360/ 180/120	350/150	3.3	1.65	16-pin QFN
MMA6280Q*	1.5/2/4/6	XZ	800/600/ 300/200	350/150	3.3	1.65	16-pin QFN
MMA6281Q*	2.5/3.3/ 6.7/10	XZ	800/600/ 300/200	350/150	3.3	1.65	16-pin QFN
MMA6270Q*	1.5/2/4/6	XY	800/600/ 300/200	350	3.3	1.65	16-pin QFN
MMA6271Q*	2.5/3.3/ 6.7/10	XY	800/600/ 300/200	350	3.3	1.65	16-pin QFN
MMA6261Q	1.5	XY	800	300	3.3	1.65	16-pin QFN
MMA6262Q	1.5	XY	800	150	3.3	1.65	16-pin QFN
MMA6263Q	1.5	XY	800	900	3.3	1.65	16-pin QFN
MMA2260D	1.5	X	1200	50	5.0	2.5	16-pin SOIC
MMA1260D	1.5	Z	1200	50	5.0	2.5	16-pin SOIC
MMA1270D	2.5	Z	750	50	5.0	2.5	16-pin SOIC
MMA1250D	5	Z	400	50	5.0	2.5	16-pin SOIC
MMA1220D	8	Z	250	250	5.0	2.5	16-pin SOIC
MMA6231Q	10	XY	120	300	3.3	1.65	16-pin QFN
MMA6233Q	10	XY	120	900	3.3	1.65	16-pin QFN
MMA3201D	40	XY	50	400	5.0	2.5	20-pin SOIC
MMA2201D	40	X	50	400	5.0	2.5	16-pin SOIC
MMA2202D	50	X	40	400	5.0	2.5	16-pin SOIC
MMA1213D	50	Z	40	400	5.0	2.5	16-pin SOIC
MMA2204D	100	X	20	400	5.0	2.5	16-pin SOIC
MMA1210D	100	Z	20	400	5.0	2.5	16-pin SOIC
MMA1211D	150	Z	13	400	5.0	2.5	16-pin SOIC
MMA1212D	200	Z	10	400	5.0	2.5	16-pin SOIC
MMA2300D	250	X	8	400	5.0	2.5	16-pin SOIC
MMA1200D	250	Z	8	400	5.0	2.5	16-pin SOIC

*This device has selectable sensitivity

Suggested g Levels for Various Applications

Freefall Detection: 1g–2g
Mobile HDD, Cell Phone,
PC Notebook, MP3 Player



Tilt Control: 1g–2g
Movement Recognition, User
Interface, Scrolling, Gaming



Vibration: 8g–10g
Motor Stability



Pedometer: 10g–20g
Pace, Physiology



Occupant Safety: 100g
Airbag Deployment



← 1.5g 2.5g 5g 8g 10g 20g 40g 100g 250g →



Seismometry: 0.002g–2g
Geophones, Seismic Switches



Rollover: 2g–8g
Axial, Skew



Shock Detection: 8g–10g
Shipping/Handling



Motion Recorder: 40g
Event Recorder, Black Box



High Shock Detection:
250g Side Airbags

Typical Applications

- Anti-theft devices
- Appliance balance/monitoring
- Automobile rollover detection
- Automotive crash detection and suspension control
- Backup GPS
- Exercise equipment
- Fall detection
- HDD protection
- Health care applications
- Image stability
- Motion control
- Physical therapy
- Portable electronics
- Robotics
- Seismic monitoring
- Shipping/handling monitor
- Smart motor maintenance
- Sports diagnostic systems
- Vehicle dynamic control
- Vibration monitoring

Benefits

- Single board 3-D sensing
- Bidirectional multi-axis sensing
- Adaptable functionality
- Design flexibility
- Smaller package size reduces board space
- g-Select products offer flexibility to select acceleration level for multifunctional applications
- Low power for extended battery life in handheld applications
- Signal conditioned with an internal filter, reducing the number of external components.
- Low component count saves cost and space
- Highly sensitive with low noise
- High frequency and resolution for accurate fall, tilt, motion, positioning, shock and vibration sensing
- Two-chip solution utilizes partitioning allowing greater design flexibility and maximizes product performance

Learn More:

For current information about Freescale products and documentation, please visit www.freescale.com/sensors.