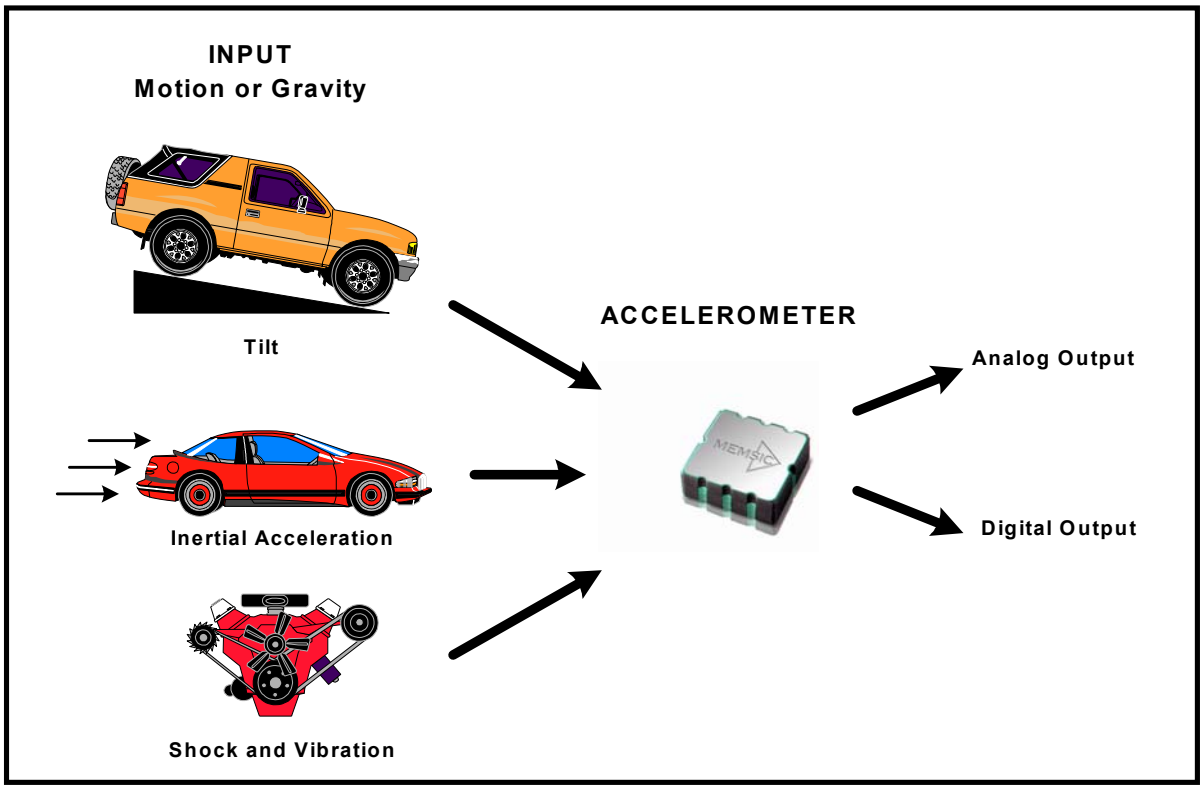
ACCELEROMETER PRIMER

Accelerometers are used to convert an acceleration from gravity or motion into an electrical signal.

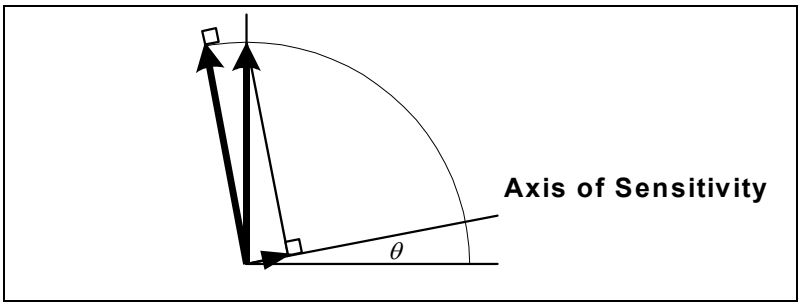


Accelerometers Measure "*g*'s".

Accelerometers measure acceleration in units of "*g*'s". One *g* is defined as the earth's gravitational pull on an object or person. Some relative *g* measurements are listed below.

1*g*	The acceleration exerted by the Earth's gravity on an object or person (for example, a cell phone on a desk experiences 1 *g* of acceleration).
0-2*g*	The acceleration range experienced by a person when walking.
10-50*g*	The acceleration experienced by an automobile in a typical crash.
100-2,000*g*	The acceleration experienced by a laptop if it is dropped from a height of three feet onto a concrete floor.
15,000*g*	The acceleration experienced by a munition when shot from a cannon.

Measuring tilt is one of the most common applications.



- Tilt applications measure "*g*'s" in the range of ±1*g*.
- Measurements of <one degree of tilt can be resolved with MEMSIC accelerometers.
- The axis of sensitivity is most sensitive to changes in tilt angles when it is nearly parallel with the Earth's surface.

Relationship between angle of inclination and *g* force.

One variable: θ - angle of inclination
One constant: *g* – Earth's gravitational force

Since: (1*g*) x (sin θ) = measured *g* force

Then, measuring g-force with an accelerometer can determine the angle of inclination:
arcsin (measured *g* force/1*g*) = angle of inclination (θ)

This is a guide to some of the questions customers will ask about accelerometers and MEMSIC devices.

If Your Customer Asks…	You Can Respond…
How do your accelerometers work?	MEMSIC devices are based on heat convection and require no proof mass. Both the sensor and the conditioning electronics are integrated into a monolithic IC and built with standard CMOS processes.
Do you need external signal conditioning circuitry?	MEMSIC accelerometers integrate all the signal conditioning circuitry required to translate an acceleration into an electrical signal. Some external circuitry may be required to interface the electrical signal to the end user's circuitry.
What is the bandwidth of your products?	MEMSIC accelerometers can measure accelerations with frequency ranges from 0 Hz to >100Hz, unlike piezoelectric or piezofilm accelerometers that cannot measure 0 Hz acceleration (tilt).
How many *g*'s can you measure?	MEMSIC accelerometers can measure anywhere from ±1*g* up to ±50*g*, depending on the specific product.
I need to measure 10m*g* of acceleration.	MEMSIC accelerometers can resolve down to less than 2m*g* of acceleration with appropriate low pass filtering external to the device.
I need to measure 1 degree of tilt.	MEMSIC ±1*g* and ±2*g* accelerometers can resolve down to less than a half of a degree of tilt with appropriate low pass filtering external to the device.
I need to measure acceleration in two or three axes.	MEMSIC accelerometers are predominantly dual axis devices yet are as cost effective as competitors' single axis devices. Two accelerometers can be combined to form a tri-axial sensor.
My current accelerometer has a stiction problem. How does MEMSIC address this issue?	MEMSIC accelerometers are based on heat convection transfer and have no proof mass. Therefore, there are no moving parts and no stiction problems. Furthermore, MEMSIC accelerometers can withstand 50,000*g* of acceleration or shock.