



Sensors

# MMA7660FC

## Three-axis low g digital acceleration sensor



### Smart Motion with Power Select

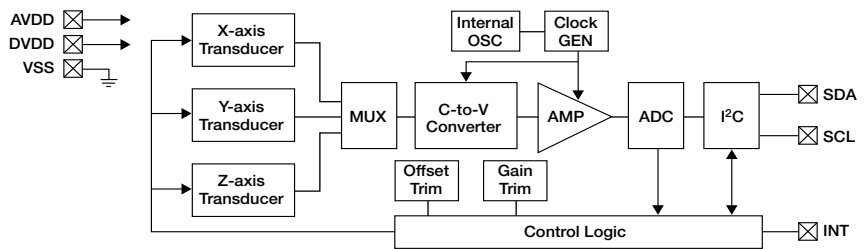
Freescale Semiconductor's MMA7660FC is a three-axis low g I<sup>2</sup>C digital capacitive acceleration sensor with extremely low power at 47 uA at one sample per second—contained in a small, low-profile 3 x 3 x 0.9 mm DFN package. The MMA7660FC accelerometer integrates intelligent features with reduced power consumption to address portable consumer devices.

The device provides conversion to digital values at a user-configurable output data rate, offering proportional savings in supply current and power. The MMA7660FC accelerometer can be used for sensor data changes, product orientation and gesture detection through an interrupt pin (INT). By providing I<sup>2</sup>C, the MMA7660FC directly interfaces to the main system processor for communication flexibility.

### Target Applications

- Mobile phones/PMP/PDA/digital cameras
  - Orientation detection (portrait/landscape)
  - Image stability
  - Text scroll
  - Motion dialing
  - Tap to mute
  - Auto wake/sleep for low power consumption
- Laptop PCs
  - Anti theft
  - Freefall detection for hard disk drives
- Gaming
  - Motion detection
- Mercury and roll ball switch replacement
- Safety shutoff
- Activity monitoring in medical applications

### MMA7660FC Block Diagram



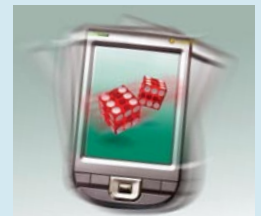
### Orientation Detection

Portrait/landscape orientation detection for applications such as mobile phones, PDAs and portable media players. The six different orientation positions include left, right, up, down, back and front. The orientation is determined in three dimensions whenever the device position becomes static via filtering and optional debouncing. This enables selection of portrait or landscape display modes and facilitates switching off the display for power saving if the product is placed face-down.



### Tap Detection

Tap detection can be used for a number of different applications such as button replacement on mobile phones, PDAs and portable media players. For example, when using a media player, a single tap can stop a song from playing and a double tap can play a song. This function detects fast transitioning pulses determined by tunable thresholds and durations.



### Shake Detection

The shake feature performs functions such as scrolling through images or Web pages on mobile phones, PDAs and portable media players. The shake interrupt can be enabled on any of the three axes.

## Features

- $\pm 1.5g$  three-axis digital accelerometer with I<sup>2</sup>C
- Low-profile 3 x 3 x 0.9 mm DFN package
- Low current consumption
  - Off mode: 0.4  $\mu A$
  - Standby mode: 2  $\mu A$
  - Active mode: 47  $\mu A$  at one sample per second
  - Configurable output data rate from 1 to 120 samples per second
- Configurable auto wake/sleep for low power consumption
- Low voltage operation: 2.4V–3.6V
  - 1.71V–3.6V for digital I/O (including I<sup>2</sup>C)
- Configurable tilt orientation detection for portrait/landscape capability
- Gesture detection including shake and tap detection
- Robust design, ability to survive shocks up to 10,000g

## Benefits

- Power select helps achieve optimal current consumption by choosing one of eight sample rates
- Low-power device with configurable power saving modes
- Intelligent device with configurable orientation, shake and tap detection
- Digital accelerometer with direct I<sup>2</sup>C interface for communication flexibility
- Compact package enables intelligent motion features in hand-held products

Freescall is a leading provider of pressure, inertial and touch sensors and has offered MEMS-based sensors for over 30 years. The sensor ICs complement Freescall's broad portfolio of ZigBee® technology, microcontrollers, microprocessors, digital signal processors, analog ICs and development tools to offer system solutions to customers.

## Selector Guide

Part Number	Acceleration (g)	High sensitivity (LSB/g)	IDD ( $\mu A$ )	Off mode ( $\mu A$ )	Standby mode ( $\mu A$ )	Communication	Package
MMA7660FCT MMA7660FCR1	+/-1.5	21	47 at 1 sample per second	0.4	2	I <sup>2</sup> C	3 x 3 x 0.9 mm DFN

## Development Tools

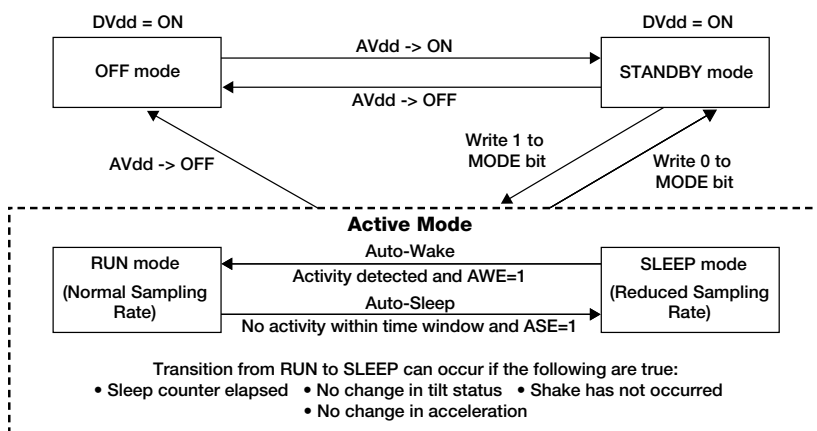
Part Number	Description
RD3803MMA7660FC	A complete kit that includes the evaluation board plus the DIP board as well as software and USB connectors
KIT3803MMA7660FC	A simple DIP board that is extremely helpful for sampling the device

## Documentation

Document Number	Title	Description
MMA7660FC	MMA7660FC Data Sheet	Presents the specifications for this product
AN3803	Using the MMA7660FC Accelerometer Evaluation Board	Presents how to use the accelerometer evaluation board
Quick Start Guide	The RD3803MMA7660FC Quick Start Guide	Presents how to get started quickly with the RD3803MMA7660FC

## Modes of Operation

Measurement and Power Mode	I <sup>2</sup> C Bus	DVdd	AVdd	Function
Power Down Mode	MMA7660FC clamps I <sup>2</sup> C bus to DVdd pin. I <sup>2</sup> C bus cannot be used by other devices.	Off	Off	I <sup>2</sup> C activity is not available on bus
		Off	On	I <sup>2</sup> C activity is not available on bus
Off Mode	MMA7660FC does not load the I <sup>2</sup> C bus and does not respond. Bus can be used by other devices.	On	Off	I <sup>2</sup> C activity is ignored by MMA7660FC
Standby Mode	MMA7660FC responds to I <sup>2</sup> C bus activity	On	On	MMA7660FC registers can be accessed to set device to Active Mode when desired. Sensor measurement system is idle.
Active Mode with Auto-Sleep and Auto-Wake features	MMA7660FC responds to I <sup>2</sup> C bus activity	On	On	MMA7660FC sensor measurement system runs at programmable output data rate. Digital analysis functions run. Tap detection does not operate in Sleep state.



## Learn More:

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