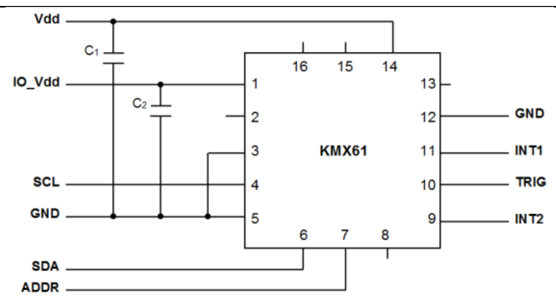
Introduction

The purpose of this application note is to illustrate how the Kionix KMX62 accelerometer-magnetometer can replace an existing Kionix KMX61 accelerometer-magnetometer.

Pin Compatibility

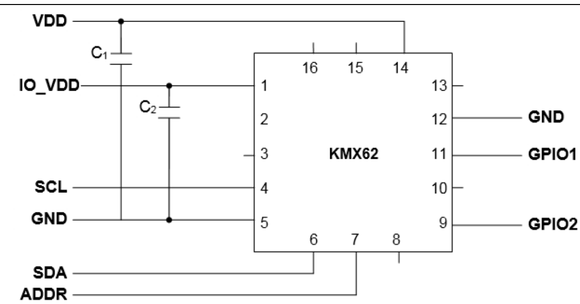
The KMX61 accelerometer-magnetometer can be replaced by a KMX62 accelerometer magnetometer for I2C interface application.

KMX61



Pin	Name	Description
1	IO Vdd	The power supply input for the digital communication bus. Optionally decouple this pin to ground with a 0.1uF ceramic capacitor.
2	Reserved	Leave this pin unconnected or alternatively couple this pin to ground with a 1 uF ceramic capacitor.
3	GND	Ground
4	SCL	I²C Serial Clock
5	GND	Ground
6	SDA	I²C Serial Data
7	ADDR	I²C Address pin .This pin can be connected to IO_VDD or GND to determine the I2C Device Address.
8	NC	Not Internally Connected
9	INT2	Physical Interrupt 2
10	TRIG	Trigger input for buffer. Connect to GND if not used.
11	INT1	Physical Interrupt 1
12	GND	Ground
13	NC	Not Internally Connected
14	Vdd	The power supply input. Decouple this pin to ground with a 0.1uF ceramic capacitor.
15	NC	Not Internally Connected
16	NC	Not Internally Connected

KMX62



Pin	Name	Description
1	IO_VDD	The power supply input for the digital communication bus. Optionally decouple this pin to ground with a 0.1uF ceramic capacitor.
2	CAP	Do not connect. Must be left floating.
3	GND[1]	Ground
4	SCL	I²C Serial Clock
5	GND[1]	Ground
6	SDA	I²C Serial Data
7	ADDR	I²C Address pin.This pin must be connected to IO_VDD or GND to determine the I2C Device Address.
8	NC	Not Internally Connected
9	GPIO2	GPIO 2. Cannot float when configured as an input.
10	NC	Not Internally Connected
11	GPIO1	GPIO 1. Cannot float when configured as an input.
12	GND[1]	Ground
13	NC	Not Internally Connected
14	VDD	The power supply input. Decouple this pin to ground with a 0.1uF ceramic capacitor.
15	NC	Not Internally Connected
16	NC	Not Internally Connected

Figure 1: Pin Description KMX61 vs KMX62

Side-by-Side Comparison

The following are key differences in hardware and software between the KMX61 and the KMX62 accelerometer-magnetometers:

Features

KMX61		KMX62	
Back To Sleep			
		Free Fall	Free Fall Motion Detection Interrupt
Wake Up	Accelerometer Wake Up Only	Accelerometer Wake Up	Accelerometer Motion Interrupt
		Mag Wake Up	Magnetometer Motion Interrupt
INT1	Output Only	GPIO1	Settable Push Pull/Open Drain also Active High Low, Also acts as input for FIFO trigger
INT2		GPIO2	
Self Test	SELT_TEST register	Self Test	Accessed inside of CNTL_REG1

Kionix

Specifications

Magnetometer

			KMX61	KMX62
Magnetometer	Full Scale Range	± µT	1200	1200
	Digital Bit Depth	bits	14	16
	Offset at Zero Mag Field	± µT	0	0
	Offset Temp Coeff	± µT/°C	0.3	0.3
	Magnetic Sensitivity	± µT/LSB	0.146	0.0366
	Sensitivity Temp Coeff	± %/°C	0.05	0.05
	Integral Non-Linearity	± % of FS	0.5	0.5
	Noise (at 50Hz ODR)	µT (RMS)	0.4	0.3
	Cross-Axes Sensitivity	± % of FS	-1.1 (Sxy) 3.6 (Sxz) 2.1 (Syx) 0.3 (Syz) 0.8 (Szx) -1.7 (Szy)	2.0 (Sxy) 0.5 (Sxz) 0.3 (Syx) 0.2 (Syz) 0.9 (Szx) 0.2 (Szy)
	Maximum Exposed Field	µT	1,000,000	500,000

Accelerometer

				KMX61	KMX62
Accelerometer	Full Scale Range	GSEL1 = 0, GSEL0 = 0	g	±2	±2
		GSEL1 = 0, GSEL0 = 1		±4	±4
		GSEL1 =1, GSEL0 = 0		±8	±8
		GSEL1 =1, GSEL0 = 1		N/A	±16
	Digital Bit Depth		bits	12 or 14	16
	Zero-g Offset		mg	±25	±25
	Zero-g Offset Temperature Coefficient		± mg/°C	0.25	0.25
	Sensitivity	GSEL1 = 0, GSEL0 = 0 (±2g)	mg/LSB	0.98	0.06
		GSEL1 = 0, GSEL0 = 1 (±4g)		1.95	0.12
		GSEL1 =1, GSEL0 = 0 (±8g)		3.91	0.24
		GSEL1 =1, GSEL0 = 1 (±16g)		N/A	0.49
	Sensitivity Temperature Coefficient		± %/°C	0.03	0.01
	Positive Self-Test Output Change on Activation		g	1.4 (x) 0.7 (y) 0.6 (z)	0.5
	Sensor Mechanical Resonance (-3dB)		Hz	3500 (xy) 1800 (z)	3500 (xy) 1800 (z)
	Integral Non-Linearity		% ofFS	1	1
	Noise (at 50Hz ODR)		mg (RMS)	1.25	0.75
	Cross-Axes Sensitivity		± % of FS	0.5 (Sxy) -0.4 (Sxz) 0.2 (Syx) -0.2 (Syz) 0.2(Szx) 0.7 (Szy)	-2.0 (Sxy) 0.1 (Sxz) 2.7 (Syx) -0.7 (Syz) -0.8 (Szx) 1.4 (Szy)

Temperature:

			KMX61	KMX62
Temperature	Tempereature	Bit Deapth	14	16

Register Differences

I2C Address (Hex)	KMX61 Register Name	KMX62 Register Name
00h	WHO_AM_I	WHO_AM_I
01h	INS1	INS1
02h	INS2	INS2
03h	STATUS_REG	INS3
05h		INL
0Ah	ACCEL_XOUT_L	ACCEL_XOUT_L
0Bh	ACCEL_XOUT_H	ACCEL_XOUT_H
0Ch	ACCEL_YOUT_L	ACCEL_YOUT_L
0Dh	ACCEL_YOUT_H	ACCEL_YOUT_H
0Eh	ACCEL_ZOUT_L	ACCEL_ZOUT_L

0Fh	ACCEL_ZOUT_H	ACCEL_ZOUT_H
10h	TEMP_OUT_L	MAG_XOUT_L
11h	TEMP_OUT_H	MAG_XOUT_H
12h	MAG_XOUT_L	MAG_YOUT_L
13h	MAG_XOUT_H	MAG_YOUT_H
14h	MAG_YOUT_L	MAG_ZOUT_L
15h	MAG_YOUT_H	MAG_ZOUT_H
16h	MAG_ZOUT_L	TEMP_OUT_L
17h	MAG_ZOUT_H	TEMP_OUT_H
18h	XOUT_HPF_L	
19h	XOUT_HPF_H	
1Ah	YOUT_HPF_L	
1Bh	YOUT_HPF_H	
1Ch	ZOUT_HPF_L	
1Dh	ZOUT_HPF_H	
24h	SN_1	
25h	SN_2	
26h	SN_3	
27h	SN_4	
28h	INL	
29h	STBY_REG	
2Ah	CNTL1	INC1
2Bh	CNTL2	INC2
2Ch	ODCNTL	INC3
2Dh	INC1	INC4
2Eh	INC2	INC5
2Fh	INC3	AMI_CNTL1
30h		AMI_CNTL2
31h		AMI_CNTL3
32h		MMI_CNTL1
33h		MMI_CNTL2
34h		MMI_CNTL3
35h		FFI_CNTL1
36h		FFI_CNTL2
37h		FFI_CNTL3
38h		ODCNTL
39h		CNTL1
3Ah		CNTL2
3Ch	COTR	COTR
3Dh	WUFTH	
3Eh	WUFC	
3Fh	BTH	
40h	BTSC	
4Ch	TEMP_EN_CNTL	*inside of CNTL_REG2*
60h	SELF_TEST	*Inside of CNTL_REG1*
76h	BUF_THRESH_H	
77h	BUF_THRESH_L	BUF_CTRL_1
78h	BUF_CTRL1	BUF_CTRL_2
79h	BUF_CTRL2	BUF_CTRL_3
7Ah	BUF_CLEAR	BUF_CLEAR
7Bh	BUF_STATUS_REG	BUF_STATUS_1
7Ch	BUF_STATUS_H	BUF_STATUS_2
7Dh	BUF_STATUS_L	BUF_STATUS_3
7Eh	BUF_READ	BUF_READ

The Kionix Advantage

Kionix technology provides for X, Y, and Z-axis sensing on a single, silicon chip. One accelerometer can be used to enable a variety of simultaneous features including, but not limited to:

Hard Disk Drive protection
Vibration analysis
Tilt screen navigation
Sports modeling
Theft, man-down, accident alarm
Image stability, screen orientation & scrolling
Computer pointer
Navigation, mapping
Game playing
Automatic sleep mode

Theory of Operation

Kionix MEMS linear tri-axis accelerometers function on the principle of differential capacitance. Acceleration causes displacement of a silicon structure resulting in a change in capacitance. A signal-conditioning CMOS technology ASIC detects and transforms changes in capacitance into an analog output voltage, which is proportional to acceleration. These outputs can then be sent to a micro-controller for integration into various applications. For product summaries, specifications, and schematics, please refer to the Kionix MEMS accelerometer product sheets at
http://www.kionix.com/parametric/Accelerometers