UM0537
User manual

STEVAL-MKI019V1
demonstration kit for the LIS302SG

Introduction

The STEVAL-MKI019V1 is a demonstration kit designed to provide the user with a complete, ready-to-use platform for the evaluation of the LIS302SG. The LIS302SG is a low-power 3-axis linear capacitive accelerometer that includes a sensing element and an IC interface capable of taking information from the sensing element and providing an analog signal to an external application.

In addition to the MEMS sensor, the system includes a linear voltage regulator and a rail-to-rail low noise quad amplifier configured as a non-inverting buffer, making both direct sensor outputs and buffered sensor outputs available to the user.

The kit also provides an easy way to control the Power-down and Self-test pins.

1 Demonstration kit description

The block diagram of the demonstration kit and the layout of the board are shown respectively in *Figure 1* and *Figure 2*, while the full board photo of is provided in *Figure 3*.

Figure 1. Demonstration board block diagram

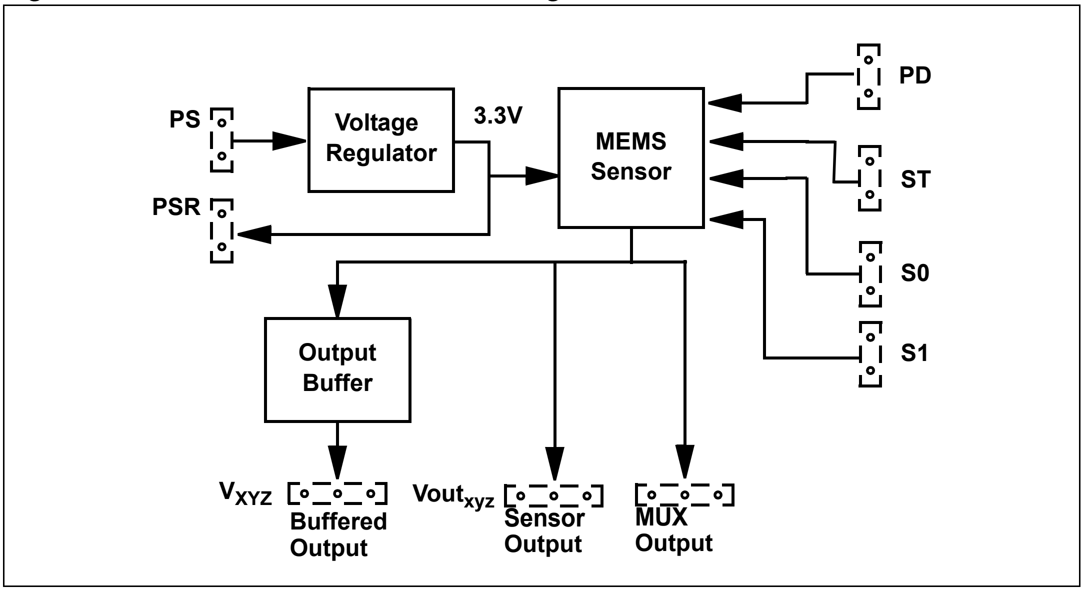


Figure 2. Top silk-screen for STEVAL-MKI019V1 board layout

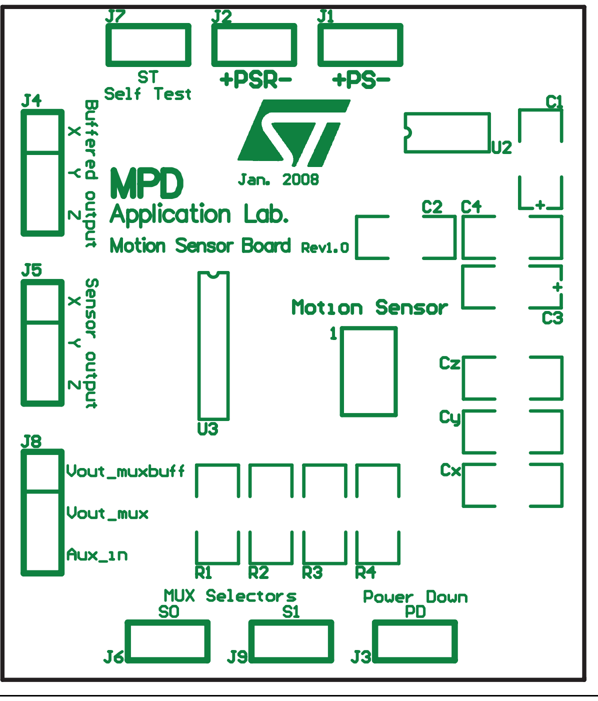
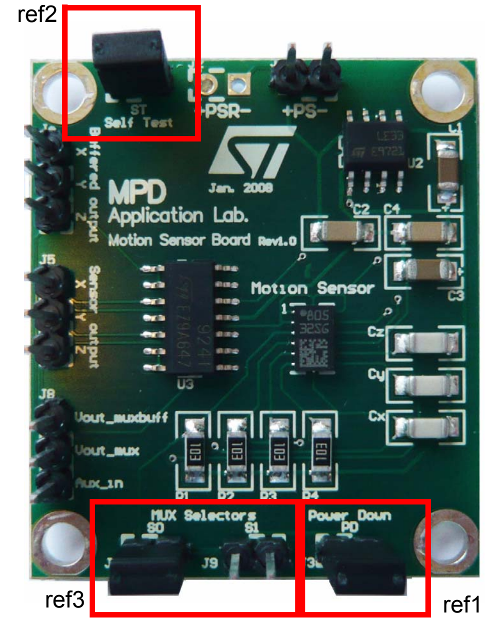


Figure 3. STEVAL-MKI019V1 board photograph



1.1 Operating the demonstration kit

To operate the demonstration kit it is necessary to supply it through the connector marked J1 (PS) with a dc voltage between 3.7 V and 18 V. The suggested supply voltage is 5 V. The typical current consumption of the LIS302SG MEMS sensor is 0.65 mA, while the typical current consumption of the whole board is in the range of 6 mA.

The voltage applied to the board is then regulated through a linear voltage regulator which supplies the MEMS sensor at 3.3 V.

The outputs ($Vout_x$, $Vout_y$ and $Vout_z$) of the LIS302SG linear accelerometer are band limited through the use of three 4.7 nF capacitors (Cx, Cy and Cz) which, together with the sensor's 32 kΩ output resistor R_{out}, create a single-pole low-pass filter with a cut-off frequency of approximately 1 kHz.

If a different cut-off frequency f_t is required, the user should replace the above capacitors with components having values derived using the following formula:

Equation 1

$$C(x, y, x) = \frac{1}{2 \cdot \pi \cdot R_{out} \cdot f_t}$$

As mentioned above, the STEVAL-MKI016V1 makes both the direct sensor outputs and the buffered signals available through two separate connectors: J4 (Sensor Output) and J3 (Buffered Output). Specifically, the three channels are made available from the left to right of the board in the order $Vout_x$, $Vout_y$ and $Vout_z$.

The buffering of the sensor outputs is achieved through the use of a rail-to-rail low-noise quad-amplifier configured as a non-inverting buffer.

1.2 Driving Power-down and self-test signals

The board allows the control of the Power-down and Self-test signals through the use of test points (marked J3 and J7, respectively) and jumpers.

1.2.1 Power-down

When the jumper is removed from J3 (Power-down, *Figure 3*, ref1) the MEMS sensor is in normal mode, otherwise it is in power-down mode.

1.2.2 Self-test

When the jumper is removed from J7 (Self-Test, *Figure 3*, ref2) the self-test feature is disabled. In order to activate the self-test feature the jumper must be inserted into J7.

When this function is activated the seismic mass of the sensor is moved by means of an electrostatic test-force, simulating a definite input acceleration. Under these conditions the sensor outputs will exhibit a voltage change in their DC levels as specified in the datasheet of the LIS302SG sensor.

1.2.3 Multiplexed output

The device provides an embedded multiplexer to allow the redirection of either the analog output signals $Vout_x$, $Vout_y$, and $Vout_z$ or of an auxiliary input signal onto a single pin for operation with a single channel A/D converter. Output selection can be achieved through jumpers J6 and J9 (S0 and S1, *Figure 3*, ref3). Refer to *Table 1* for MUX configuration.

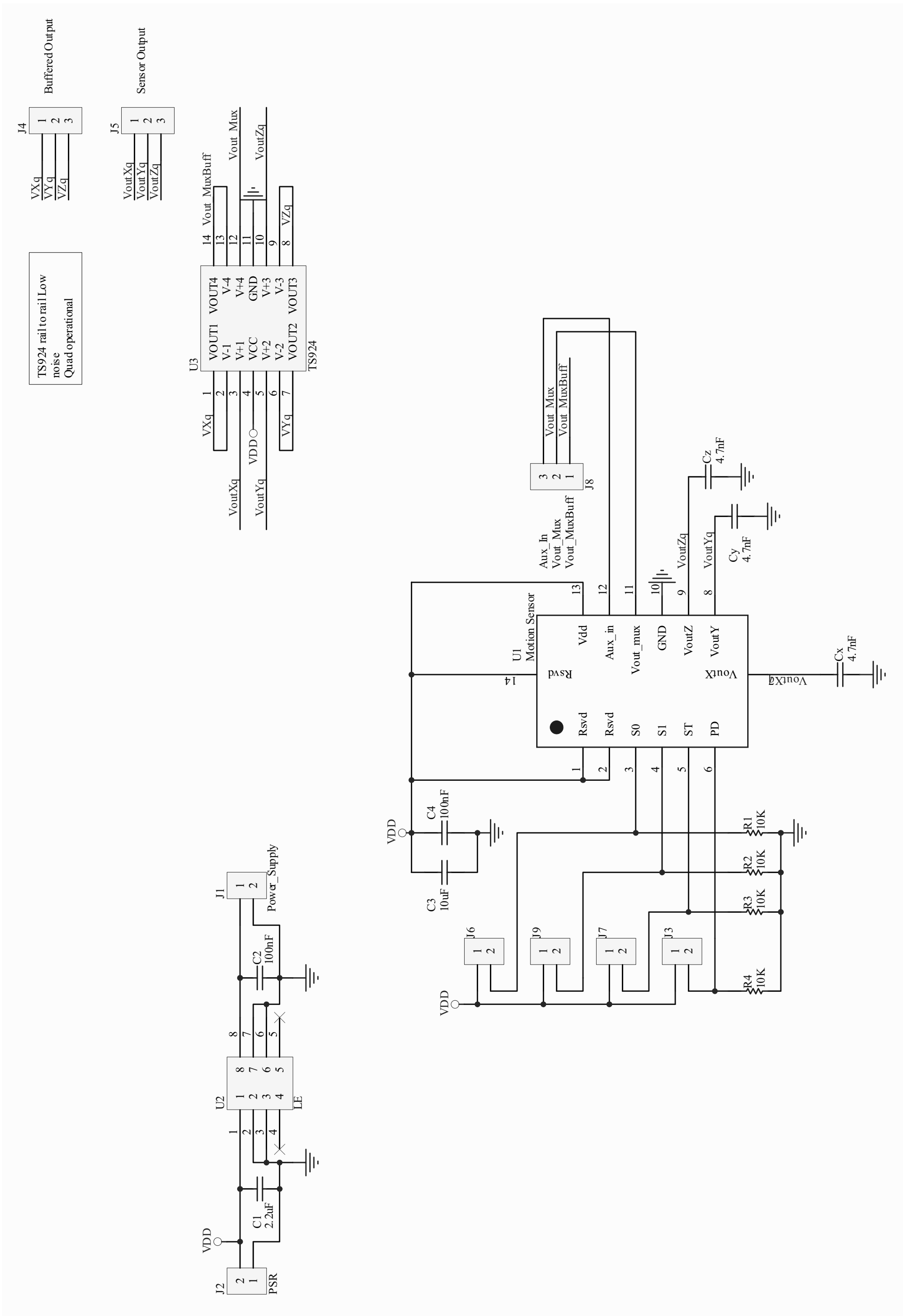
Table 1. MUX I/O table

S1 pin	S0 pin	MUX status
0	0	Vout=Vout X
0	1	Vout=Vout Y
1	0	Vout=Vout Z
1	1	Vout=Aux_in

2 Schematic diagram

The schematic diagram of the STEVAL-MKI019V1 demonstration kit is shown in *Figure 4*.

Figure 4. Schematic diagram for STEVAL-MKI019V1 board



3 Bill of material

The bill of material for STEVAL-MKI019V1 demonstration kit is provided in *Table 2*.

Table 2. Bill of material

Item	Quantity	Reference	Value
1	2	C2,C4	100 nF
2	1	C1	2.2 µF
3	3	Cx,Cy,Cz	4.7 nF
4	1	C3	10 µF
5	4	R1, R2, R3, R4	10 kΩ
6	6	J1,J2,J3,J6,J7,J9	CON2
7	3	J4,J5,J8	CON3
8	1	U1	LIS302SG
9	1	U2	LE33
10	1	U3	TS924

4 Revision history

Table 3. Document revision history

Date	Revision	Changes
24-June-2008	1	Initial release.
17-Oct-2008	2	Changed: *Figure 4*