UM0614
User manual

STEVAL-MKI021V1 demonstration kit for the LIS331AL

Introduction

The STEVAL-MKI021V1 is a demonstration kit designed to provide the user with a complete, ready-to-use platform for the evaluation of the LIS331AL. The LIS331AL is the smallest consumer low-power 3-axis linear capacitive accelerometer. It 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 means to control the power-down and self-test pins.

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1 Demonstration kit description

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

Figure 1. Demonstration board block diagram

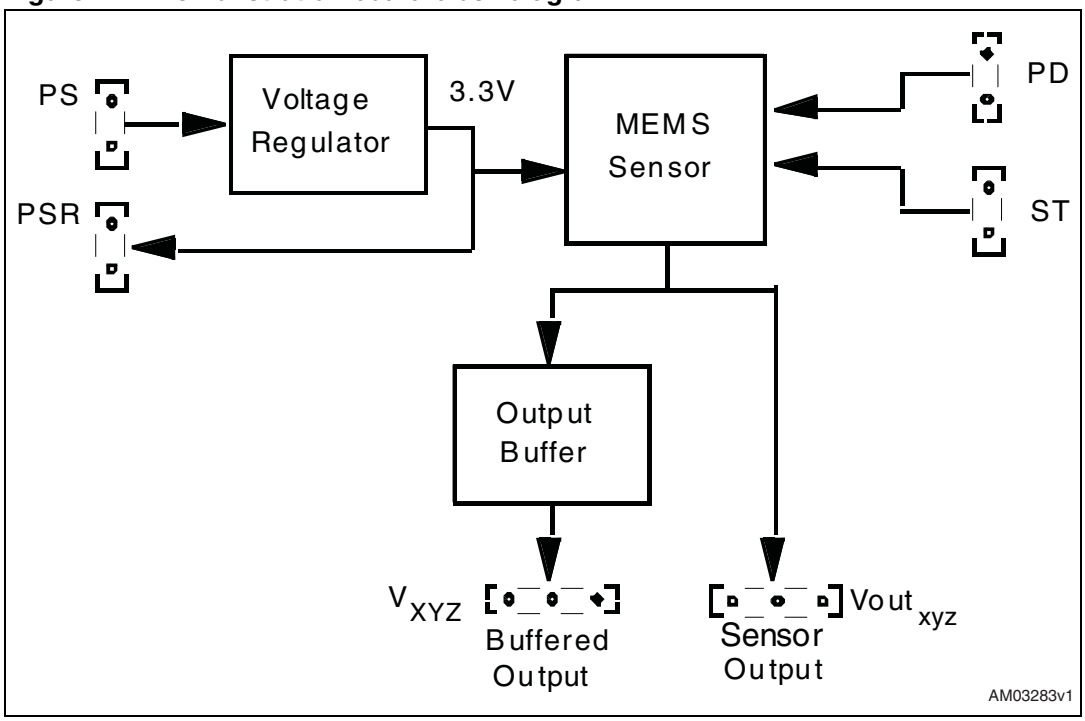

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Figure 2. Top silk-screen board layout for the STEVAL-MKI021V1

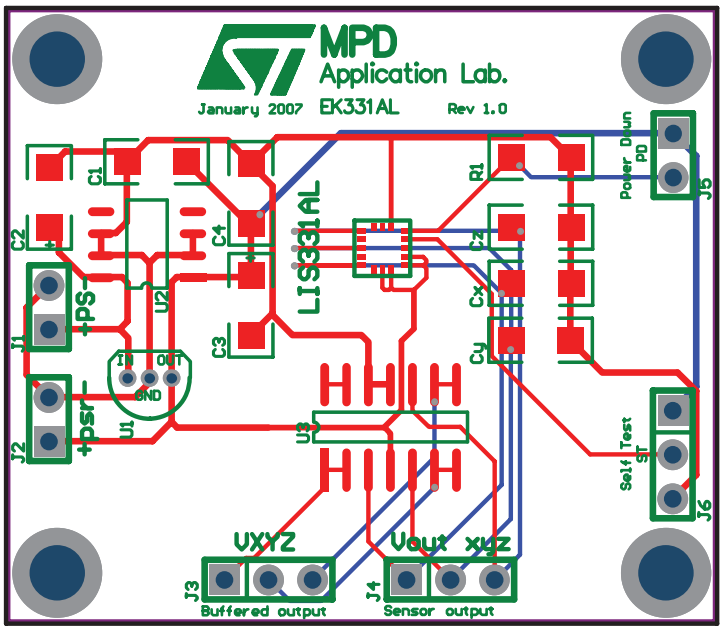
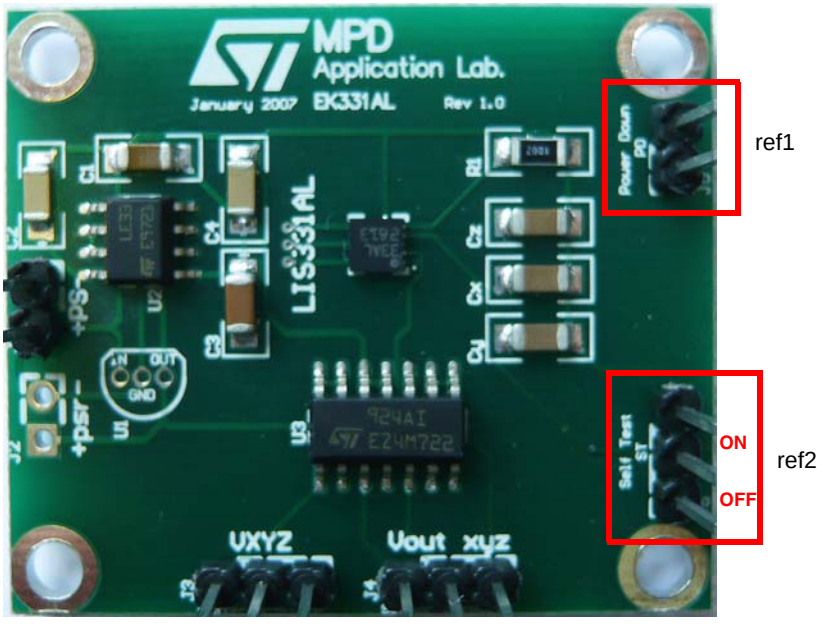


Figure 3. STEVAL-MKI021V1 board photograph



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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 LIS331AL 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 (V_{OUTx}, V_{OUTy} and V_{OUTz}) of the LIS331AL 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 V_{OUTx}, V_{OUTy} and V_{OUTz}.

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 J5 and J6, respectively) and jumpers.

1.2.1 Power-down

When the jumper is removed from J5 (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 J6 (self-test, *Figure 3*, ref2) is in "OFF" position the self-test feature is disabled. In order to activate the self-test feature the jumper must be in the "ON" position.

When the self-test 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 for the LIS331AL sensor.

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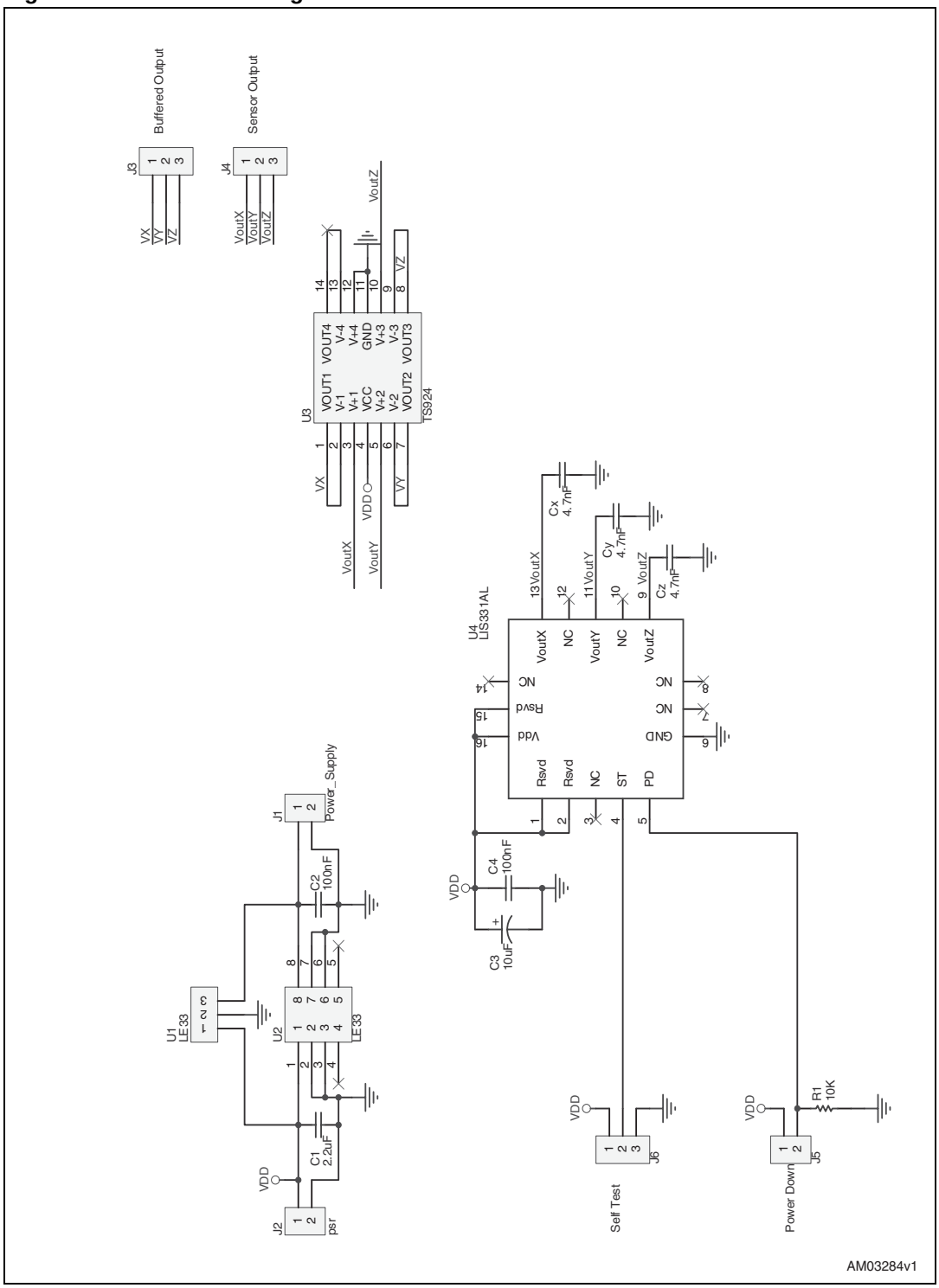
2 Schematic diagram

The schematic diagram of the STEVAL-MKI021V1 demonstration kit is shown in *Figure 4*.

Figure 4. Schematic diagram for the STEVAL-MKI021V1



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3 Bill of material

The bill of material for STEVAL-MKI021V1 demonstration kit is provided in *Table 1*.

Table 1. 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	3	J1, J2, J5	CON2
7	3	J3, J4, J6	CON3
8	1	U1	LIS331AL
9	1	U2	LE33
10	1	U3	TS924

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4 Revision history

Table 2. Document revision history

Date	Revision	Changes
15-Dec-2008	1	Initial release.

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