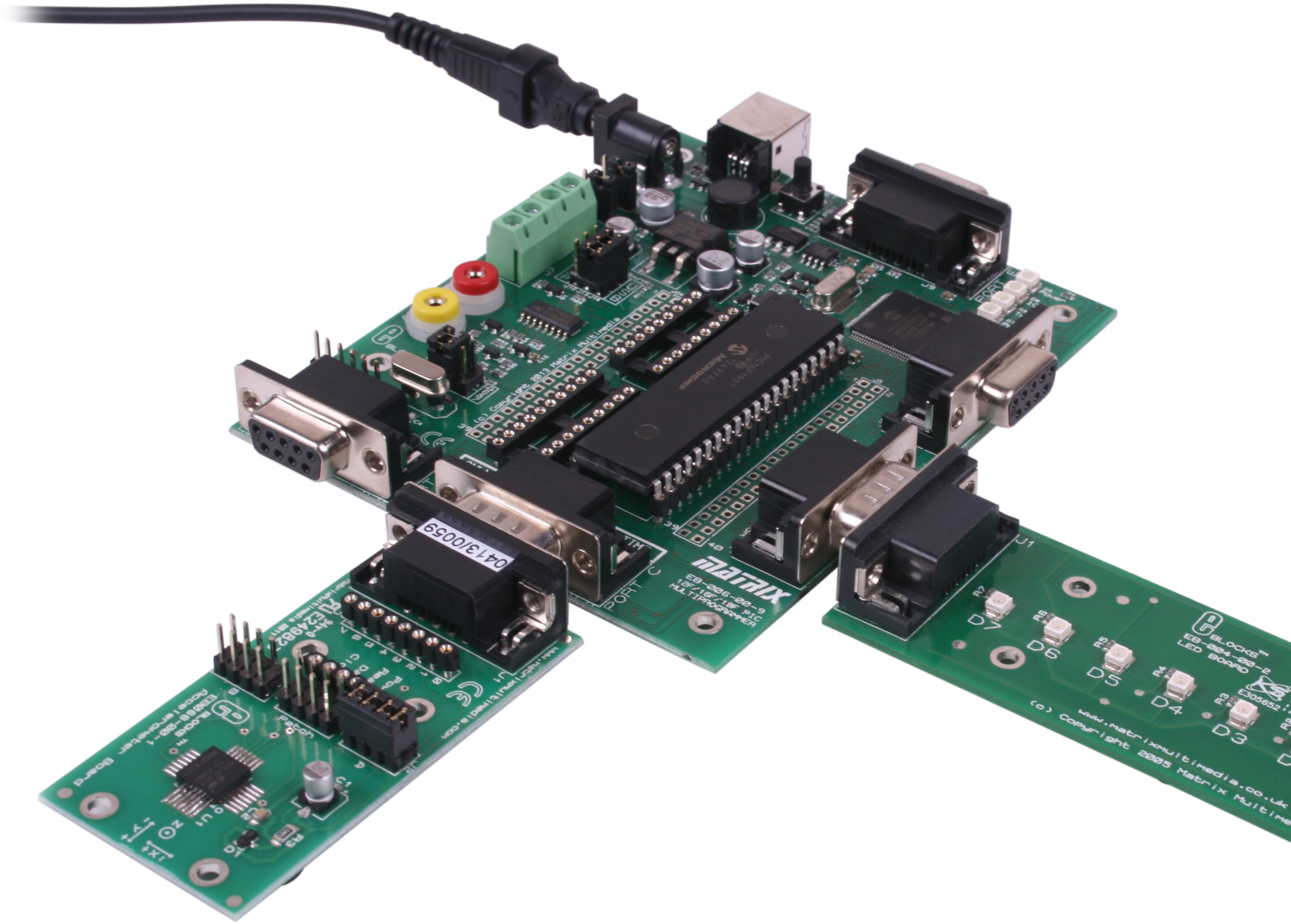
MATRIX

eBLOCKS®

Accelerometer board

Contents



About this document

This document concerns the EB068 E-blocks accelerometer board.

1. Trademarks and copyright

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2. Disclaimer

The information provided within this document is correct at the time of going to press. Matrix Technology Solutions Ltd reserves the right to change specifications from time to time.

3. Testing this product

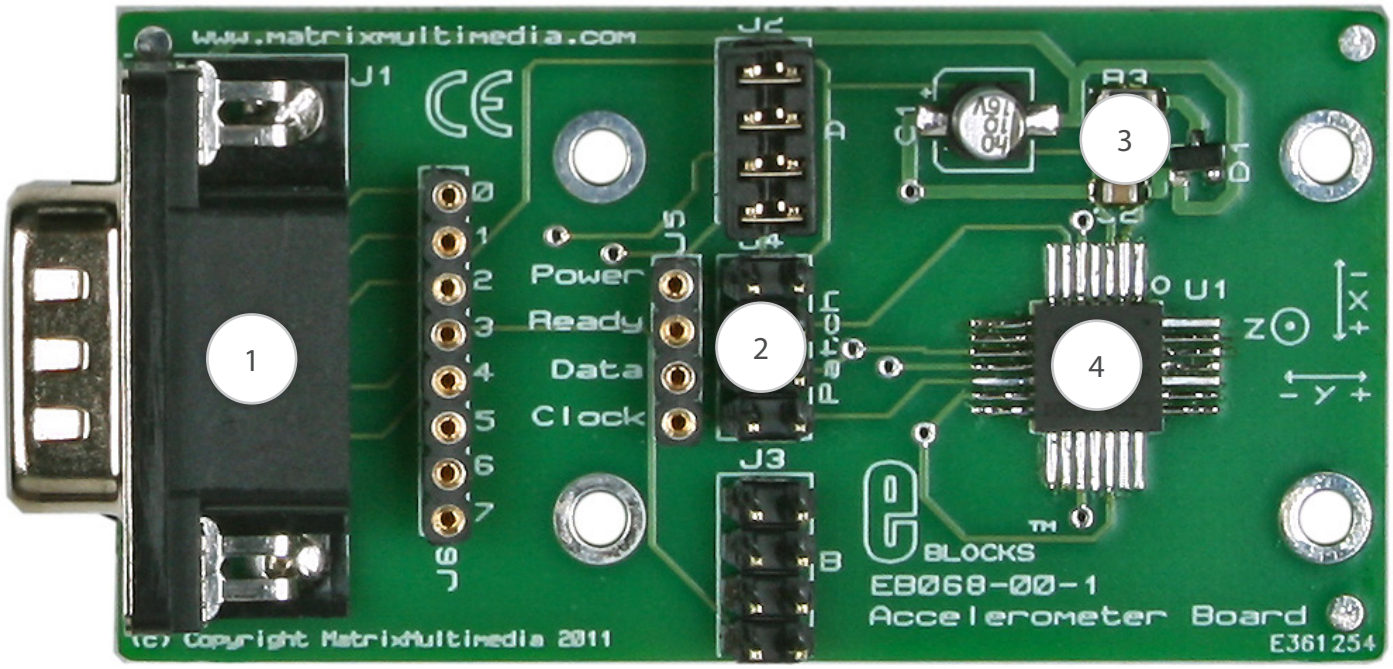
It is advisable to test the product upon receiving it to ensure it works correctly. Matrix provides test procedures for all E-blocks, which can be found in the Support section of the website.

4. Product support

If you require support for this product then please visit the Matrix website, which contains many learning resources for the E-blocks series. On our website you will find:

- How to get started with E-blocks - if you are new to E-blocks and wish to learn how to use them from the beginning there are resources available to help.
- Relevant software and hardware that allow you to use your E-blocks product better.
- Example files and programs.
- Ways to get technical support for your product, either via the forums or by contacting us directly.

Board layout



1. 9-way downstream D-type connector
2. Patch system
3. Accelerometer voltage stabilisation
4. Accelerometer module

General information

The board features a 3-axis acceleration sensor capable of sensing acceleration to +/-2G or +/-6G. The board can be used to measure G force or can also be used to measure orientation in terms of pan / tilt and roll. A few typical applications for the board include force meters, balancing robotics, calibration tools and digital spirit levels.

1. Features

- 3 Axis (X, Y, Z)
- Selectable range and sensitivity (+/-2G or +/- 6G)
- Selectable data rate
- 10-bit data for each axis
- I2C interface
- Powered from an I/O pin
- 3.3V and 5V compatible
- E-blocks compatible.

2. Connections

The patch system on the board is used to route the signals from the microcontroller to the signals for the accelerometer. Here is a table showing the signal positions when the different jumper settings are being used.

Signal	Jumper A	Jumper B	Patch
Power	Bit 2	Bit 1	Patch
Ready	Bit 0	Bit 0	Patch
SDA	Bit 1	Bit 4	Patch
SCL	Bit 4	Bit 3	Patch

When the jumper is in the patch position, single core wire can be used to wire any of the signals to any of the microcontroller pins allowing for maximum flexibility and inter-operability.

Testing this product

The following instructions describe the test procedure for the EB068-00-1 Accelerometer board.

1. System Setup

Multi-programmer board (EB006) with:

EB006 Options	Setting
Power supply	External, 14V
PICmicro device	16F877A
SW1 (Fast/Slow)	Don't care
SW2 (RC/Xtal)	Xtal
Xtal frequency	19.6608MHz
Port A	Accelerometer Board EB068
Port B	LCD Board EB005
Port C	
Port D	
Port E	
Test program	Accelerometer.HEX

2. Test procedure

- Connect EB005-00-1 (LCD board) to PORTB of the Multiprogrammer.
- Connect EB068-00-1 (Accelerometer board) to PORTA of the Multiprogrammer.
- Ensure EB005 jumper setting is in the default position.
- Ensure EB068 jumper setting is in the A position.
- Connect USB cable to computer and EB006.
- Connect a wire from the +V screw terminal of the Multi-programmer to +V terminal of LCD board.
- Ensure 13.5V power supply is working correctly and connect to EB006.
- Open mLoader.
- In mLoader open file Accelerometer.HEX.
- In mLoader click on "Send" icon. A pop up window will inform you of status. If status is ok a "Program Sent And Verified" window will be observed on the screen
- The output of the accelerometer will be displayed onto the LCD.
- Move the accelerometer board around and make sure that the axis facing towards the ground has the maximum value.

If the accelerometer module is passing data through to the LCD and the data is changing appropriately when the accelerometer board is moving then the board has passed testing.

Circuit description

The EB068 Accelerometer circuit diagram can be seen on page 6.

Here is an explanation of the more common aspects of the accelerometer module operation and data format.

1. Accelerometer module

The accelerometer module used by the board is a LIS3LV02DQ 3 axis accelerometer which uses MEMS technology to provide an accurate digital output for axis X, Y and Z. The accelerometer module should not be introduced to any excessive forces such as G forces over 6G or forces such as banging/dropping the board down onto a surface. Too large or excessive forces may damage the module and prevent it from functioning as expected. For more data on the module please refer to the LIS3LV02DQ datasheet.

2. I2C Interface

The I2C interface is used to communicate with the module to allow the module to be configured and also to allow data to be read back from the module. The module has internal I2C pull-up resistors fitted so no external pull-up resistors are required. The I2C bus means that microcontrollers running at 5V or 3.3V will work perfectly well with the accelerometer without the need for voltage shifting circuitry. The module also has a data ready output pin which is used to signify to the microcontroller when new data is available. The rate at which the ready pin becomes active is determined by the data rate setting.

3. Powering up the module

The module is powered using one of the output pins from the microcontroller. This allows the module to be powered down when the accelerometer is not in use. This also means that you do not need a flying lead connected to the board as with most standard E-block boards. The board can be plugged directly into an E-blocks compatible programmer or an IDC cable can be used to allow the board to be moved around on its own.

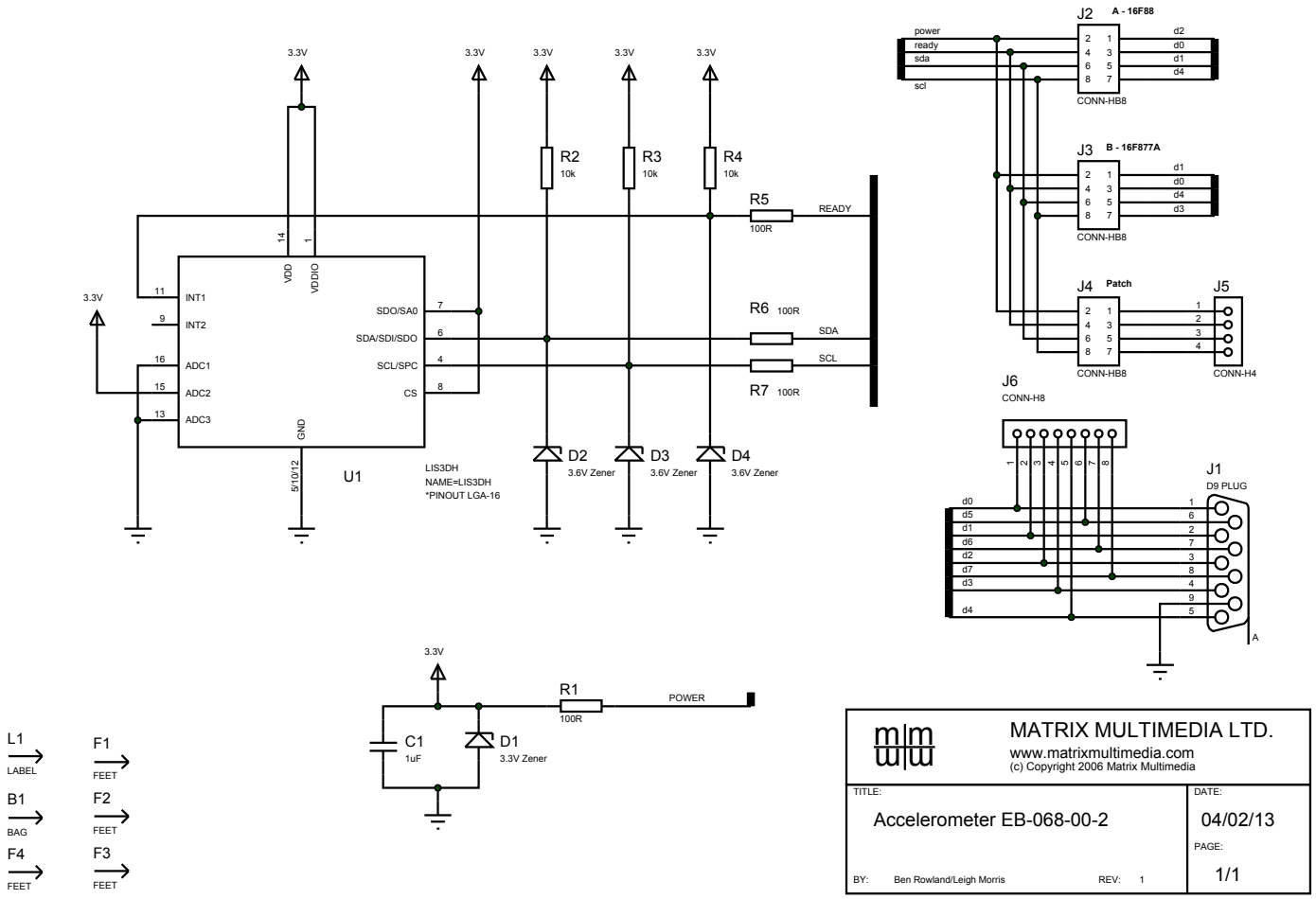
4. Accelerometer sensitivity

The accelerometer module returns its data in 10-bit format which equates to a reading between –512 to 511 being returned for each axis. The data is returned in signed format allowing the number to be positive or negative depending on the orientation of the module. When the sensor is configured in +/-2G format, each bit is worth 3.9mG therefore a reading of 256 equates to approximately 1G and –256 equates to –1G. When the sensor is configured in +/-6G format, each bit is worth 11.72G therefore a reading of 85 equates to approximately 1G and –85 equates to –1G.

5. Accelerometer data rate

The accelerometer module returns its data at a preset interval, which is programmed into the module during start up. A slower data rate has more time for the reading to settle which means that readings are generally more accurate. In this setting however small fast movements such as small vibrations can be missed or filtered out. A faster data rate means there is less time for the reading to settle meaning there will be slightly less data accuracy but vibrations and other faster movements will be sensed by the microcontroller.

Circuit diagram



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