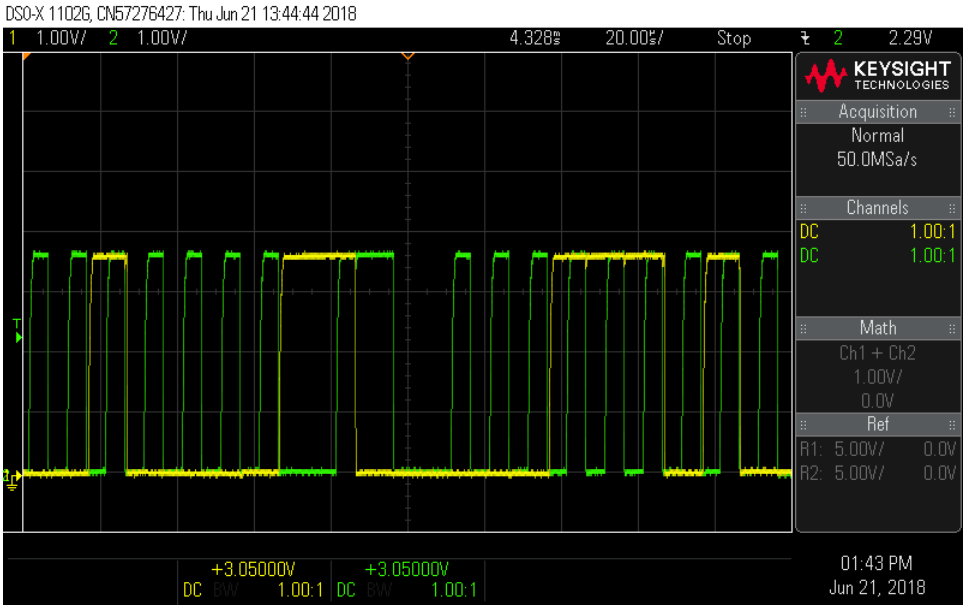
Final Product Testing

Final product testing will be carried out on the proof-of-concept mega:bits which use the HT16K33 LED matrix drivers. This was done as time did not allow for full debugging of the IS31FL3737 chip.

In this document we will explain our testing and analysis which was done using a Keysight oscilloscope.

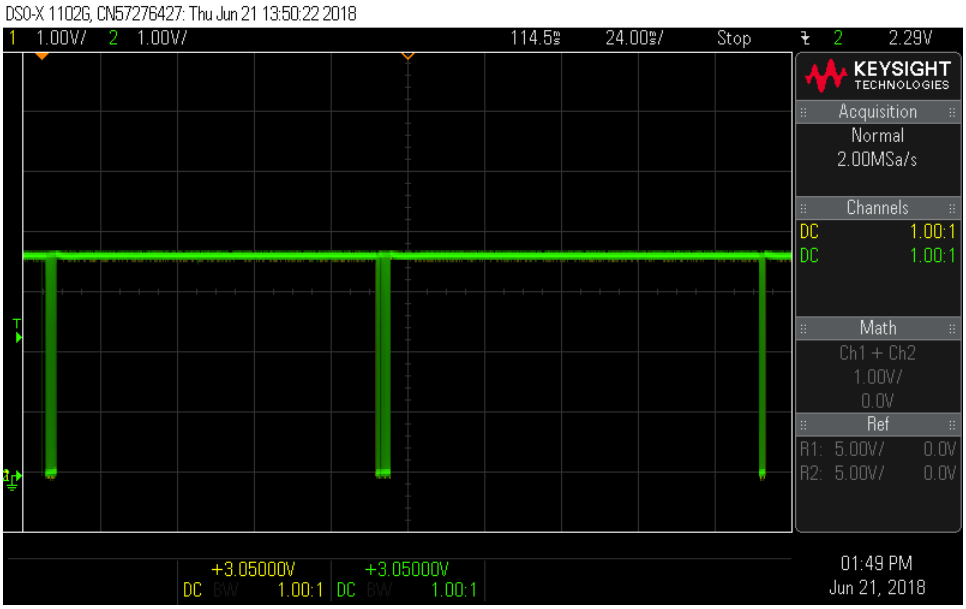
I2C Analysis

The figure below shows an example output of the I2C communication, the green trace shows the clock signal (SCL) and the yellow trace shows the data signal (SDA).

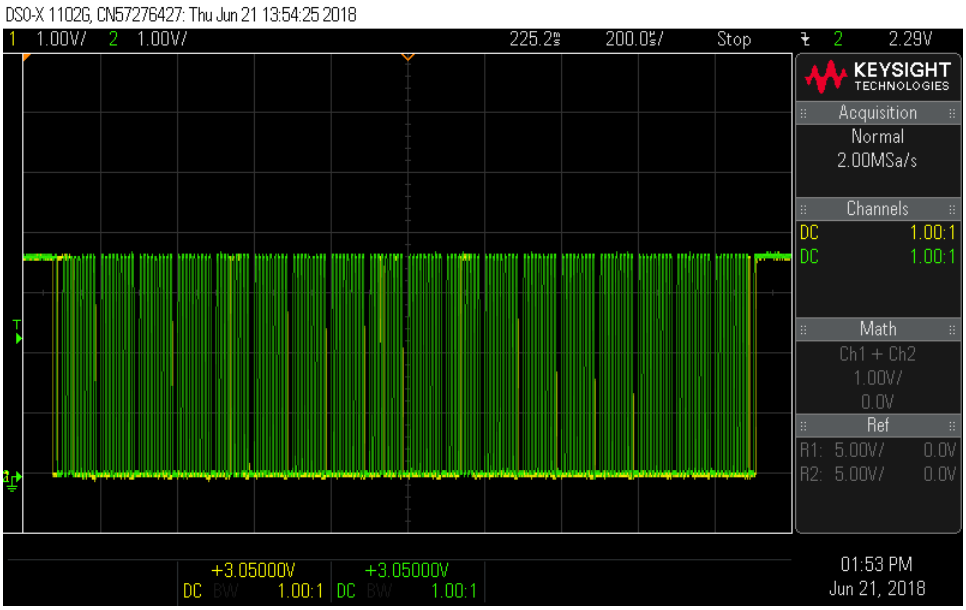


The next figure shows the startup I2C communication sequence which includes three transmissions setting the following:

1. Turning on the display oscillator
2. Setting the blink rate to 0
3. Setting the brightness to full

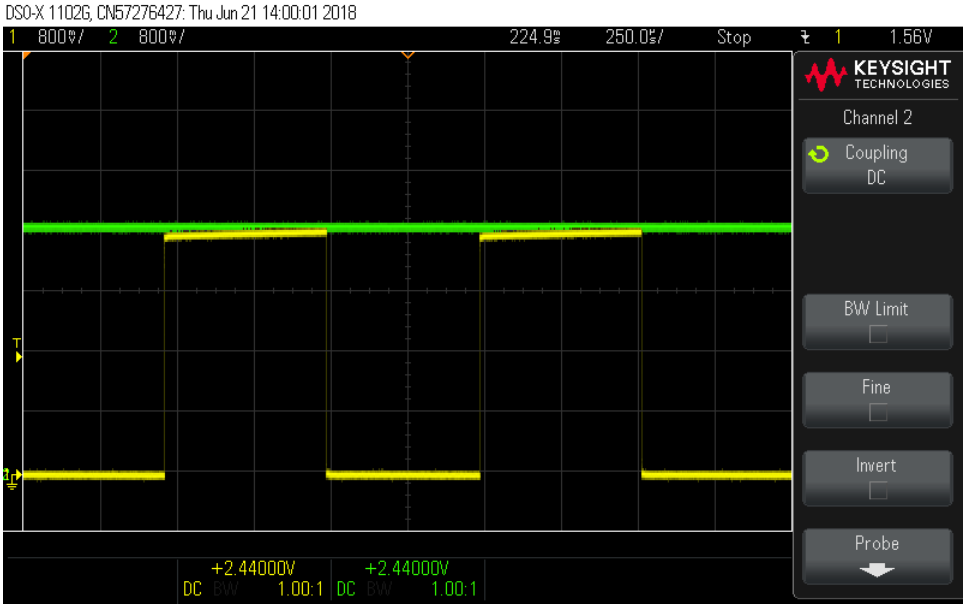


The figure below shows a single I2C transmission which is setting the display to show an image. As can be seen from the figure, it is 1.8ms long. This is good since a 2ms delay would be imperceptible to the naked eye and prove seemless to the user.



Handshake Analysis

The figure below shows the 1kHz handshake frequency (yellow trace) against the 3.3V bus voltage. The frequency proved to be accurate and stable which is obviously desirable for confident identification by the micro:bit.



Display Tests

Many example programs, images and text strings were tested, and all performed perfectly as expected. Brightness changes and animations (image/text scrolling) also worked flawlessly.

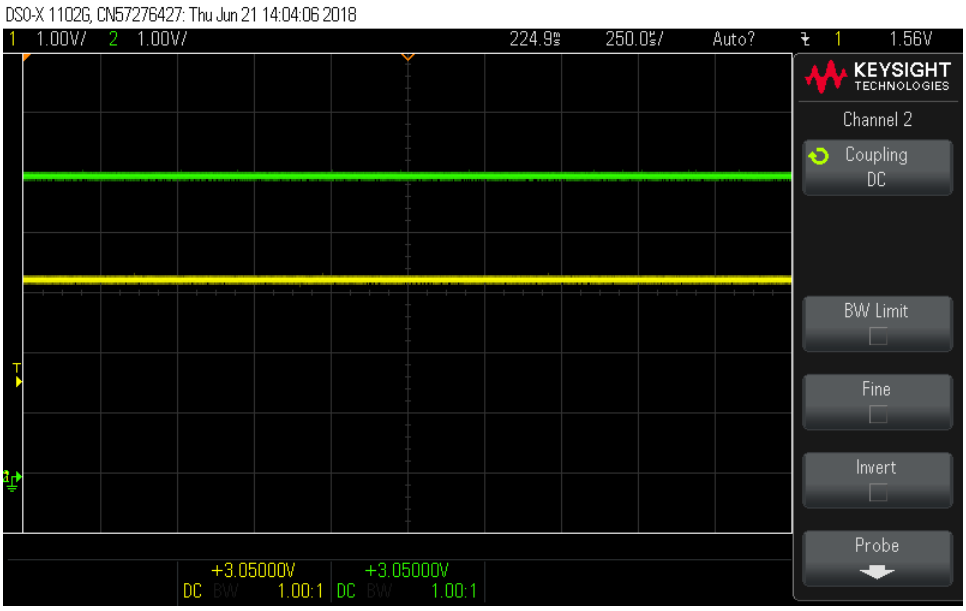
Distance Tests

The mega:bit was also tested at distance, to simulate a large classroom. The figure below shows one such test, the mega:bit worked perfectly up to the full width of the labs available which is around 25 meters, much larger than most standard classrooms. The device was also tested in direct sun light outside and it reached 5m with sun shining towards

the front of the teacher, and with sun behind the teacher it reached about 15m. Although this is not adequate for teaching, it is not expected to be used outside since the students need to use computers, so therefore is not an issue.

Short Circuit Tests

The figure below shows the 3.3V and 5V rail voltages.



The final test was a quick short circuit test in which we methodically short circuited every track on the PCB for up to 3 seconds. Although this is obviously not advised since current draws would spike through the devices, it was able to withstand all tests and, at the most, just resulted in a hard reset.

Conclusion

In conclusion the mega:bit performs its required tasks perfectly without issues.