

ADXL355 interfacing with EV-COG-AD3029 platform using Mbed OS

- **Features:**

- [ADXL355](#) is low noise, low drift, low power, 3-axis MEMS accelerometer with 20-bit resolution
- It supports ± 2.048 g, ± 4.096 g, and ± 8.192 g ranges
- It features output data rate upto 4000 Hz in addition to Filter function
- It supports SPI (@10 MHz max) and I2C (@3.4 MHz max) protocol

- **Example Code:**

- Read acceleration data from external ADXL355 accelerometer using AD3029 board
 - Program (ADXL355.cpp) reads data from ADXL355 accelerometer, converts it in the form of gravitational constant 'g' and prints on serial terminal
 - ADXL355 is connected to AD3029 board using [EV-GEAR-EXPANDER1Z](#) board and connections are as follows:

ADXL355	<==>	AD3029
VDD	<==>	3V
VDDIO	<==>	3V
GND	<==>	GND
MISO	<==>	SPI0_MOSI
MOSI	<==>	SPI0_MISO
SCLK	<==>	SPI0_SCLK
CS	<==>	SPI0_CS2
DRDY	<==>	GPIO28

- **Program flow:**

- Initialize SPI at 1 MHz, 8-bit and mode 0 (ADXL355 supports mode 0) and UART at 1000000 bps
- Configure FILTER register (Address = 0x28) for ODR(Output Data Rate) = 250 Hz and Low Pass Filter cutoff = 62.5 Hz i.e. FILTER = 0x04
- Configure POWER CONTROL register (Address = 0x2D) for measurement mode i.e. POWER CONTROL = 0x00
- Configure GPIO28 pin as interrupt pin to detect rising interrupt
- When data is ready, DRDY pin will go high causing interrupt to microcontroller

- Interrupt sets data_rdy flag in interrupt service routine and main program checks if data_rdy flag is set or not
- If flag is set then, controller reads acceleration data in the order as follows: 16-bit temperature data with MSB first (Starting address = 0x06)(Actual temperature data is of 12-bit), 24-bit X-axis acceleration data with MSB first (Starting address = 0x08)(Actual X-axis data is of 20-bit), 24-bit Y-axis acceleration data with MSB first (Starting address = 0x0B)(Actual Y-axis data is of 20-bit), 24-bit Z-axis acceleration data with MSB first (Starting address = 0x0E)(Actual Z-axis data is of 20-bit).
- Temperature data is then converted into '°C' format using the formula,

$$\text{Temperature (}^{\circ}\text{C)} = (\text{Raw temperature value} - 1852)/(-9.05)+25$$
- Then acceleration data for all three axes are converted into the form of 'g' (gravitational constant). Here accelerometer range is set to default i.e. ± 2.048 g
- Then it prints acceleration and temperature data on serial monitor

- **Notes:**

- For programming AD3029 board using Mbed OS [click here](#)
- At 10 MHz sclk settings, clock is observed to be not suitable for SPI communication with ADXL355
- With given code, maximum achievable ODR = 250 Hz

- **References:**

- <https://os.mbed.com/platforms/EV-COG-AD3029LZ/>
- <https://www.analog.com/media/en/dsp-documentation/processor-manuals/ADuCM302x-mixed-signal-control-processor-hardware-reference.pdf>
- https://www.analog.com/media/en/technical-documentation/data-sheets/adxl354_355.pdf
- <https://os.mbed.com/docs/mbed-os/v5.13/apis/index.html>