

# MEASURE MULTIPLE ANALOG INPUTS AND DISPLAY ON LCD AND UART USING PSOC3

<b>Project Name:</b>	ADC_UART_LCD
<b>Associated Part Families:</b>	CY8C38xx
<b>Software Version:</b>	PSoC Creator Beta 4.0
<b>Programming Language:</b>	C
<b>Related Hardware:</b>	CY8CKIT – 001
<b>Author:</b>	M. Ganesh Raaja

## PROJECT OBJECTIVE

Demonstrates measuring multiple analog inputs using the Delta Sigma ADC and displaying the results on the LCD and UART.

## OVERVIEW

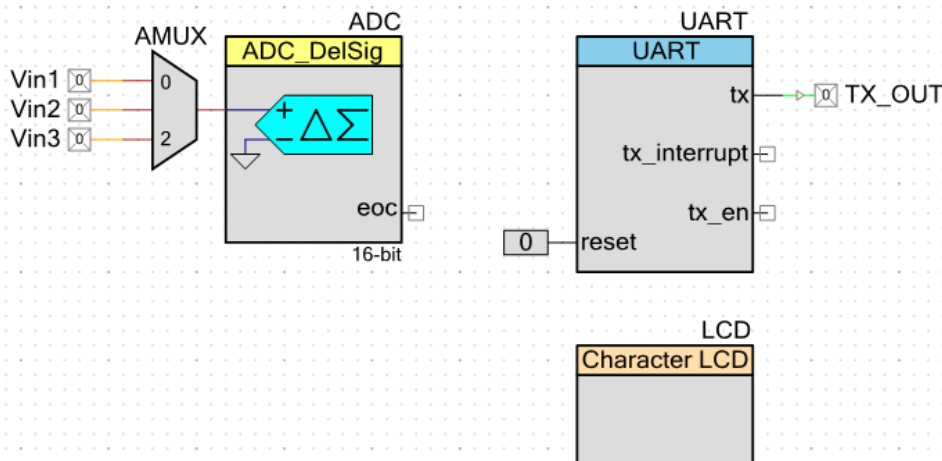
The project measures 0-2.048V signals on P0[0], P0[1] and P0[2], using an Analog Mux component and 16 bit Delta Sigma ADC and displays the hex ADC counts on an LCD. The project also sends an ASCII string over UART with the channel name, ADC count and voltage value. The project may be tested using the [CY8CKIT – 001](#) development board from Cypress Semiconductors.

## COMPONENT LIST

The following table lists components used in this project.

COMPONENT	CATEGORY
ADC	Analog >> ADC
Analog Mux	Analog
Character LCD	Display
UART	Communications
Analog Pin	Ports and Pins
Digital Output Pin	Ports and Pins
Logic Low	Digital >> Logic

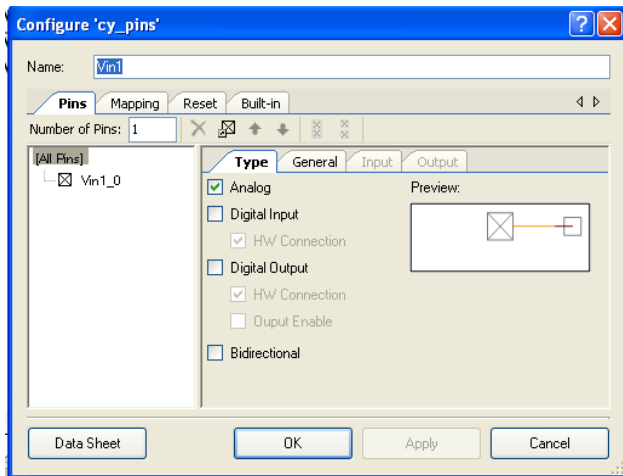
## SCHEMATIC



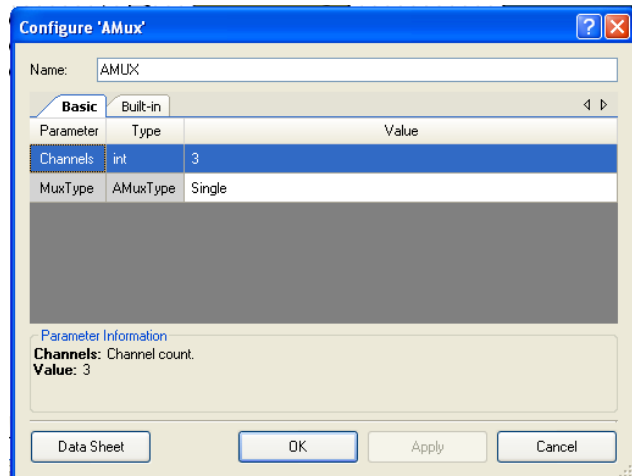
The design schematic of the project is shown above. The three input analog pins are connected to a 3 input Analog Mux component. The output of the Analog Mux is connected to a Delta Sigma ADC configured for 16 bit resolution, Single Ended input, 0 to 2.048V, Fast FIR mode. The UART is configured as TX only mode and a baud rate of 19200. A Logic 0 is connected to the reset input of the UART to disable the reset input. The tx output of the UART is connected to a Digital output pin. The Character LCD is used for displaying the results.

## COMPONENTS SETTINGS

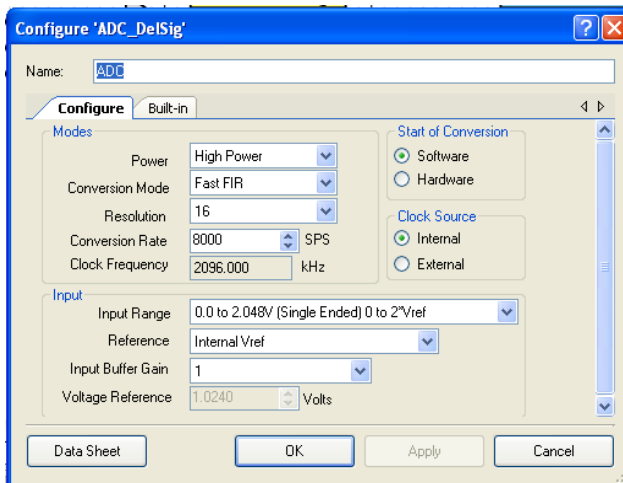
Below screen shots show the parameter settings for the components.



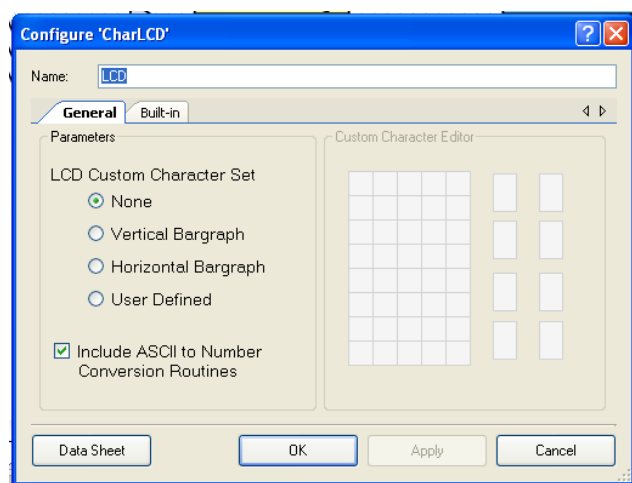
Analog Input Pins



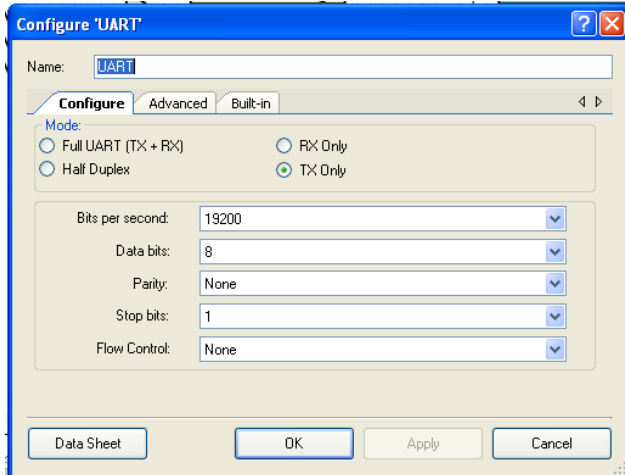
Analog Mux



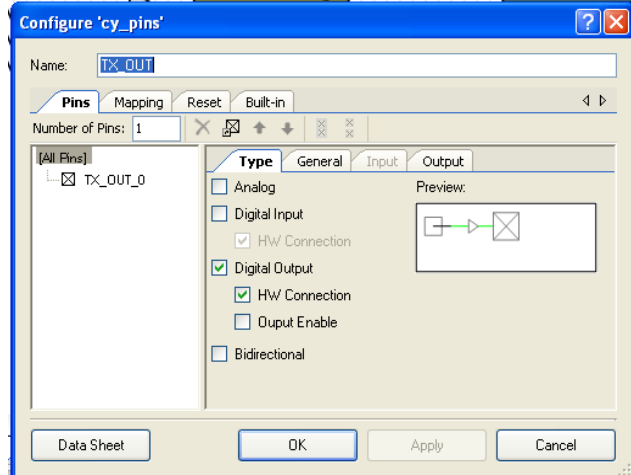
ADC



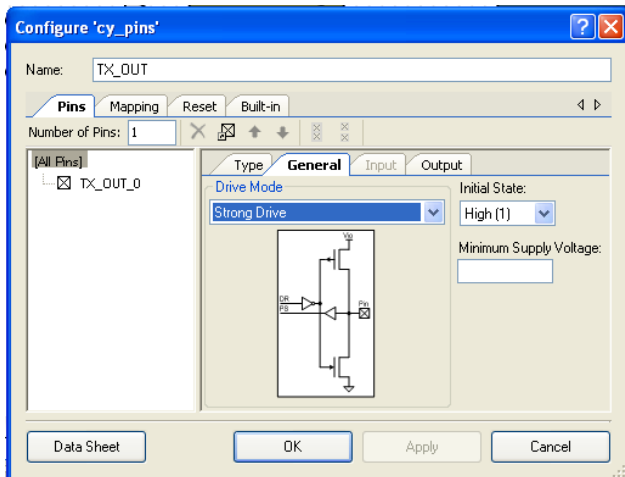
LCD



UART



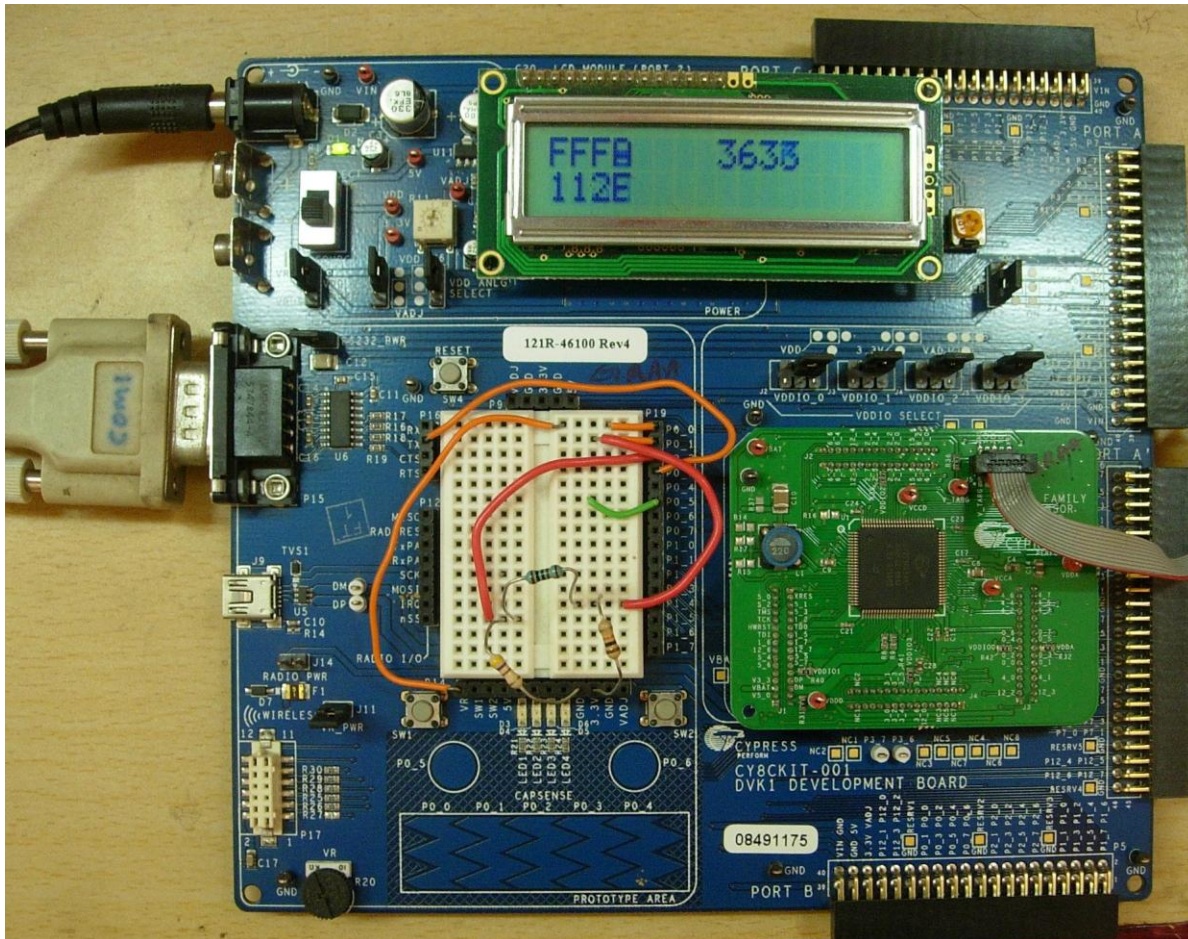
Digital Output Pin



Digital Output Pin Initial State

## HARDWARE

The project can be tested on the [CY8CKIT-001](#) evaluation board from cypress. The analog inputs are connected to the Port0 pins in P19 header. The LCD is connected to P18 header. The serial port cable is connected to the 9 pin Serial port connector P15. In the below setup, VR on P14 is used to generate one analog channel. The three resistors are used in a potential divider configuration to generate the voltage input for the other two channels. P0\_3 of P19 is connected to the TX signal on P16.



## OPERATION

The following operations are performed in main.c.

- ADC is started and the ADC conversion is initiated.
- LCD is initialized
- UART is initialized
- Analog Mux is initialized
- Global interrupts are enabled
- Inside an infinite loop following operations are performed
  - A 50mS delay is provided for the loop. This delay is optional and may be removed
  - The function ScanChannels is called. This function selects each of the 3 inputs in the Analog Mux, and stores the ADC result in the ADCResult array. In a Delta Sigma converter, the first two samples when an input is connected to an ADC are not valid. The samples are valid after the third sample. So, every time the input to the ADC is changed, 2 samples are dropped. The input voltage is calculated and stored in the array Vin.
  - The function PrintResults is called. This function prints the hex ADC values on the first and second lines of the LCD. Also, it creates a string with channel number, hex value and the voltage

values and sends it over the UART. Following screenshot shows the data received on hyperterminal

```

COM1_19200 - HyperTerminal
File Edit View Call Transfer Help
X: 6DDF 0.879; Y: 3637 0.434; Z: 1130 0.138
X: 6EEC 0.887; Y: 3635 0.434; Z: 1130 0.138
X: 70ED 0.903; Y: 3638 0.434; Z: 112F 0.137
X: 7395 0.925; Y: 3636 0.434; Z: 112F 0.137
X: 76E5 0.951; Y: 3635 0.434; Z: 1131 0.138
X: 77C4 0.958; Y: 3633 0.434; Z: 112E 0.137
X: 795F 0.971; Y: 3634 0.434; Z: 1130 0.138
X: 7C06 0.992; Y: 3634 0.434; Z: 1132 0.138
X: 7DA9 1.005; Y: 3633 0.434; Z: 112F 0.137
X: 8061 1.027; Y: 3635 0.434; Z: 1131 0.138
X: 8387 1.052; Y: 3637 0.434; Z: 1130 0.138
X: 882B 1.089; Y: 3635 0.434; Z: 1131 0.138
X: 899C 1.101; Y: 3636 0.434; Z: 1132 0.138
X: 8990 1.101; Y: 3636 0.434; Z: 1130 0.138
X: 8997 1.101; Y: 3636 0.434; Z: 112E 0.137
X: 899A 1.101; Y: 3636 0.434; Z: 1130 0.138
X: 899F 1.101; Y: 3636 0.434; Z: 1131 0.138
X: 8ECE 1.142; Y: 3636 0.434; Z: 1130 0.138
X: A2F7 1.304; Y: 3636 0.434; Z: 1132 0.138
X: A51E 1.321; Y: 3636 0.434; Z: 1132 0.138
X: A500 1.320; Y: 3637 0.434; Z: 1131 0.138
X: A509 1.320; Y: 3634 0.434; Z: 1132 0.138
X: A4F7 1.320; Y: 3635 0.434; Z: 1130 0.138
Connected 0:00:14 Auto detect 19200 8-N-1 SCROLL CAPS NUM Capture Print echo

```

### Copyright 2010, PlanetPSoc.com

Permission is hereby granted, free of charge, to any person or organization obtaining a copy of the software and accompanying documentation covered by this license (the "Software") to use, reproduce, display, distribute, execute, and transmit the Software, and to prepare derivative works of the Software, and to permit third-parties to whom the Software is furnished to do so, all subject to the following:

The copyright notices in the Software and this entire statement, including the above license grant, this restriction and the following disclaimer, must be included in all copies of the Software, in whole or in part, and all derivative works of the Software, unless such copies or derivative works are solely in the form of machine-executable object code generated by a source language processor.

THE SOFTWARE AND THIS DOCUMENTATION ARE PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE AND NON-INFRINGEMENT. IN NO EVENT SHALL THE COPYRIGHT HOLDERS OR ANYONE DISTRIBUTING THE SOFTWARE BE LIABLE FOR ANY DAMAGES OR OTHER LIABILITY, WHETHER IN CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.