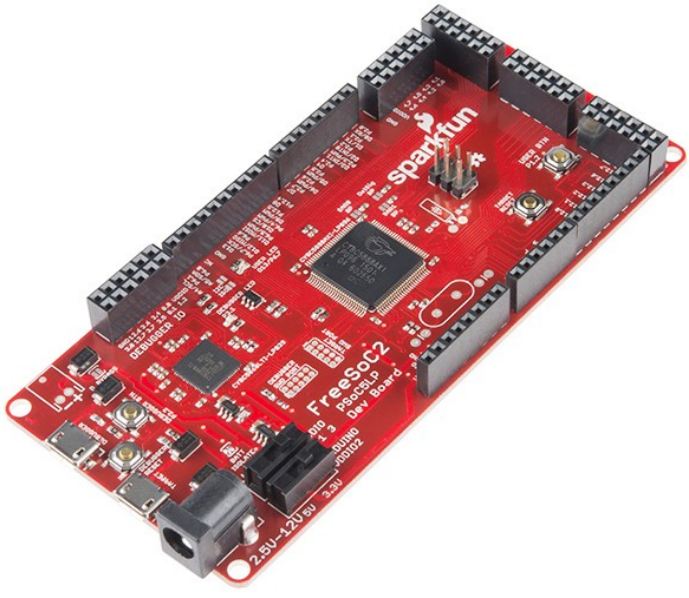
TENET TECHNETRONICS

2016

ADC in differential mode with FreeSoc2 (PSoC 5LP) using PSoC Creator



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Version: 1.0

Introduction:

The FreeSoC2 micro-controller based on the PSoC 5LP (Programmable System on a Chip) brings together features of the programmable devices and micro-controller-type systems on chips into one package. By placing a programmable fabric between the peripherals and the pins, the FreeSoC2 allows any function to be routed to any pin! Moreover, the on-board PSoC includes a number of programmable blocks which allow the user to define arbitrary digital and analog circuits for their specific application. To get the most out of the device, you will need to use the PSoC Creator IDE.

Step 1: Open PSOC creator IDE.

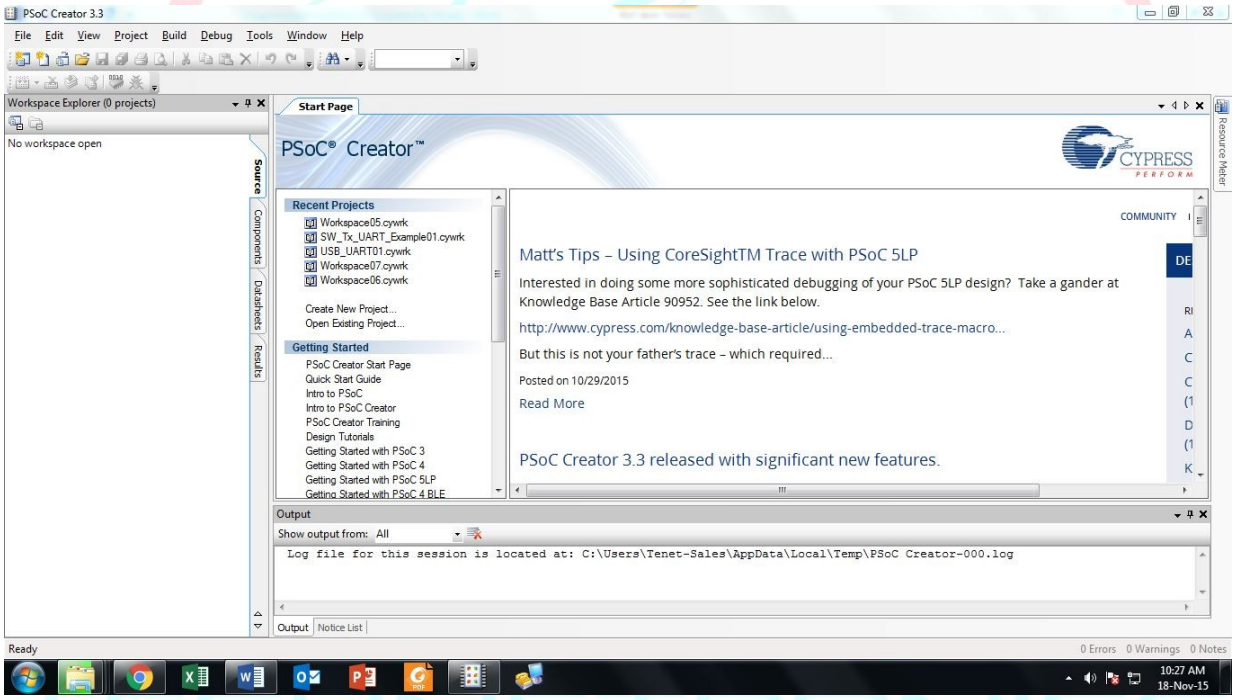

Figure 1

Step 2: File-> new project -> design -> PSoC 5LP design & save with desired name.

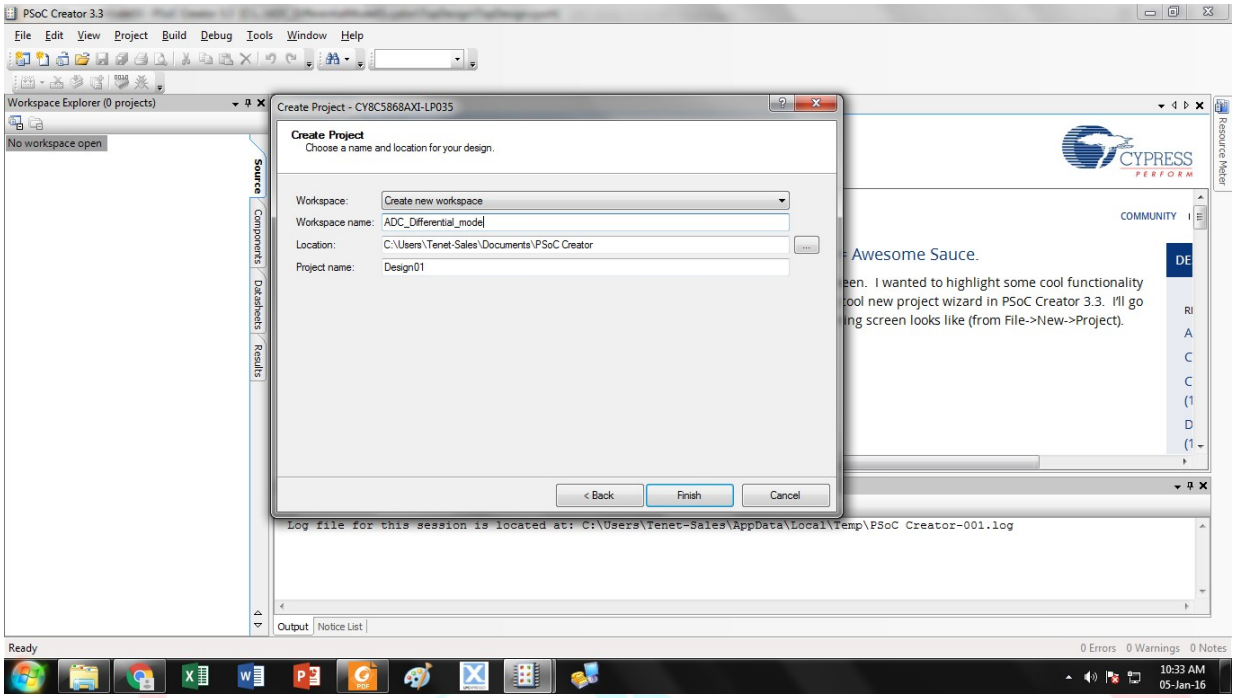

Figure 1

Step 3: Open TopDesign.cysch from workspace explorer.

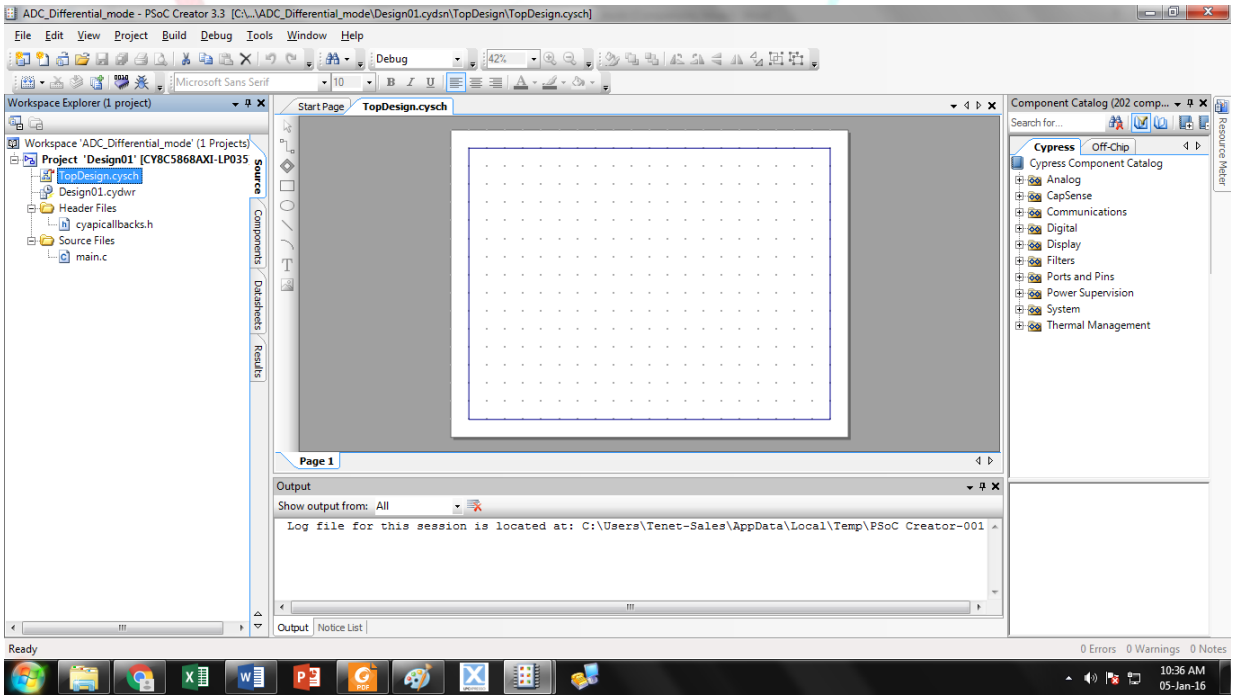

Figure 2

Step 4: To sense analog input we need Analog to Digital Converter (ADC). Let us select a Delta-Sigma ADC from Component catalog on right side of the window. Drag the ADC onto the workspace.

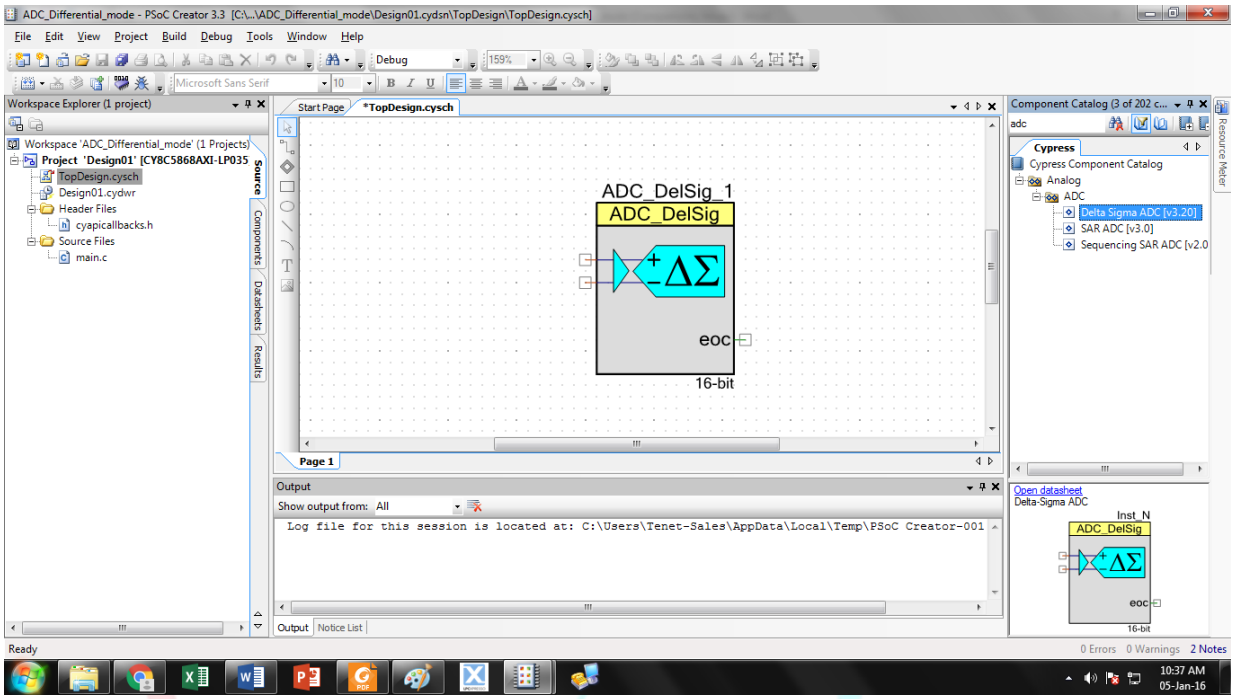

Figure 3

Step 5: Double click on the Delta-Sigma ADC and change the name if you wish to. Configure the input mode of ADC as differential Mode and 16-bit resolution.

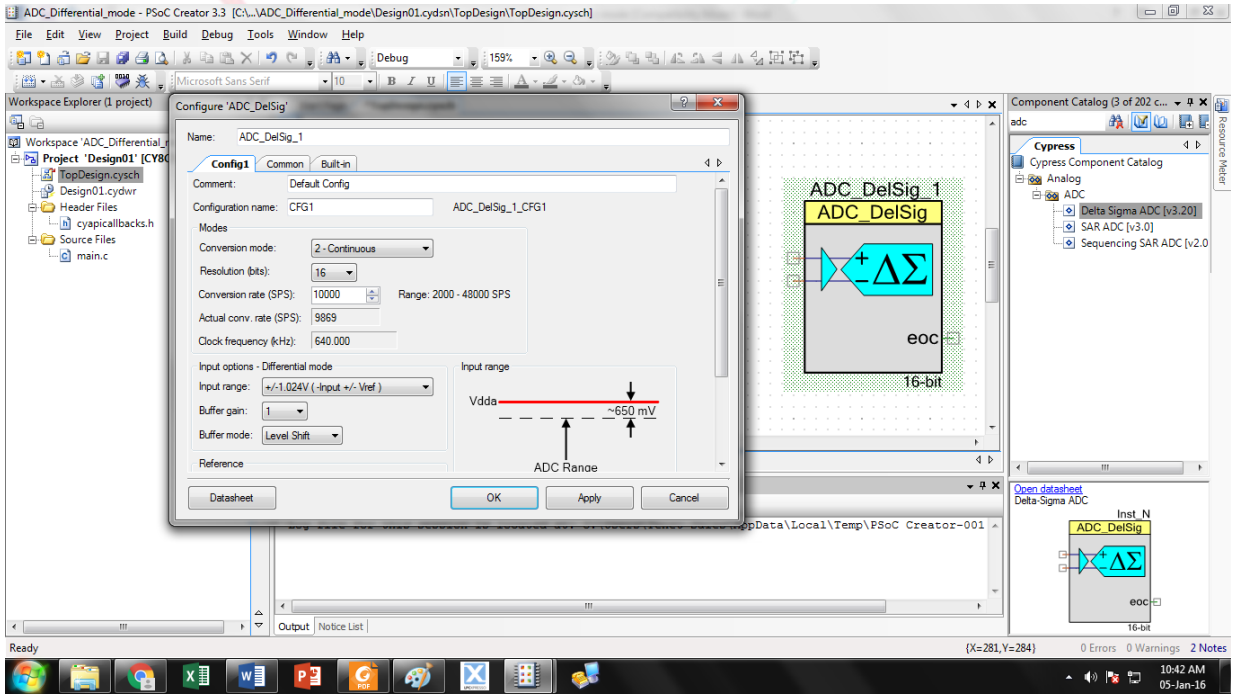

Figure 5

Step 6: We need analog pin to read analog value from potentiometer. Similarly drag the analog input and Voltage DAC (VDAC) from component catalog and configure to have limit value of 1000 mV.

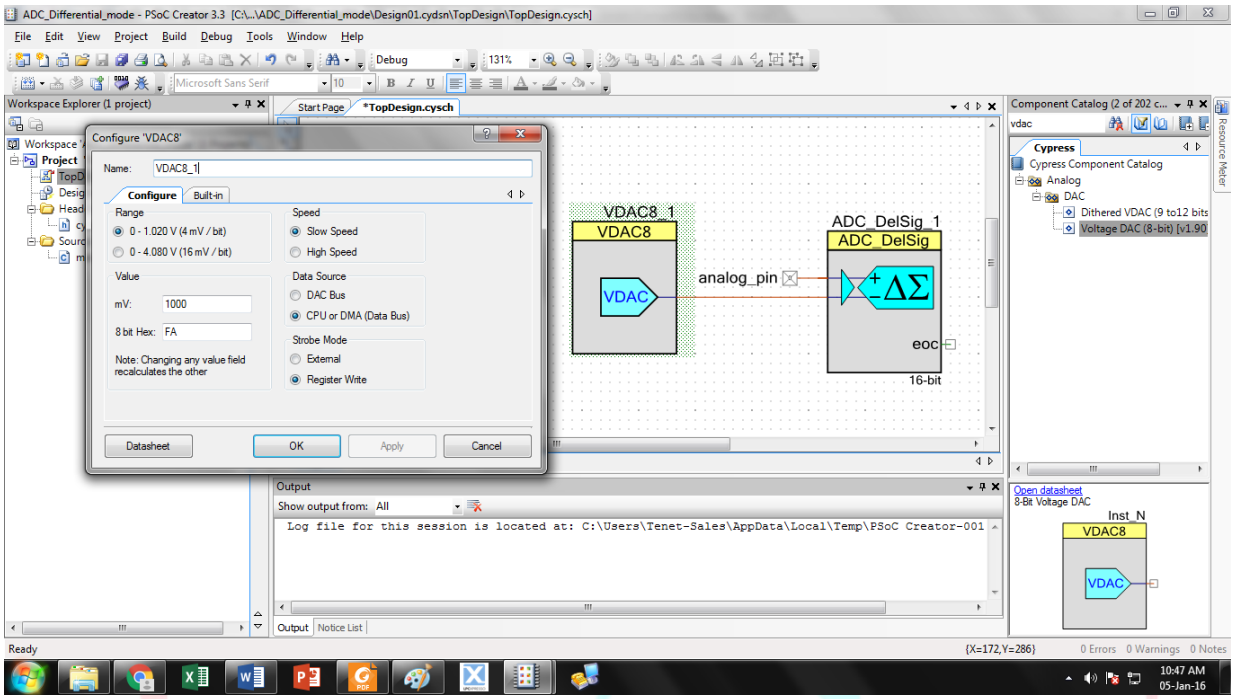

Figure 6

Step 7: We also need character LCD to display the ADC value.

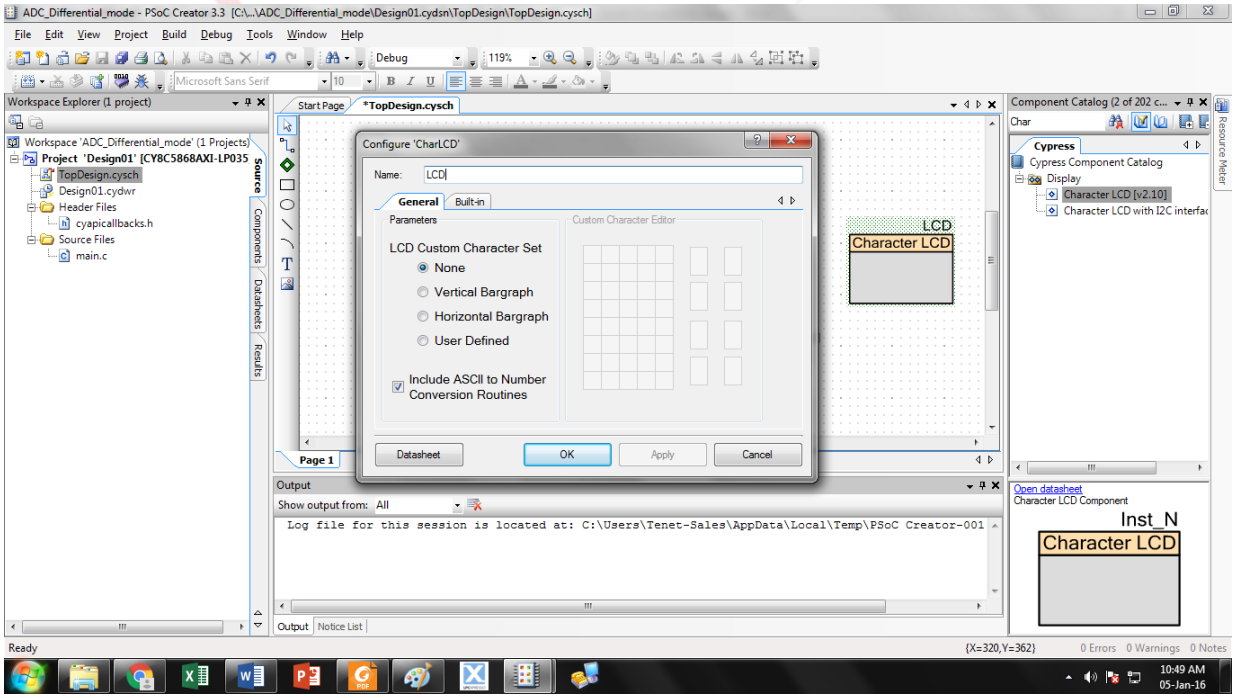

Figure 7

Step 8: After configuring build the project. As we can generate user-defined APIs which will ease us while writing code. We can see APIs generated in the Workspace Explorer on the left side of the window.

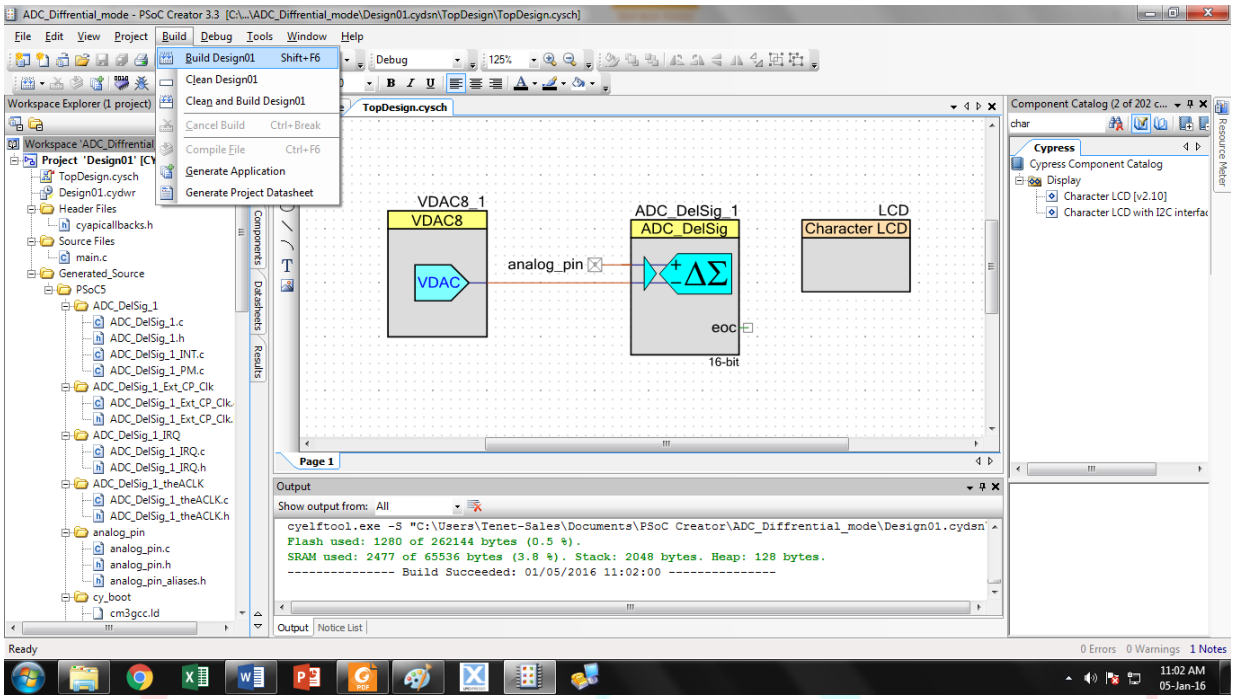

Figure 4

Step 9: Click on main.c from Workspace Explorer. Write the code and Build it.

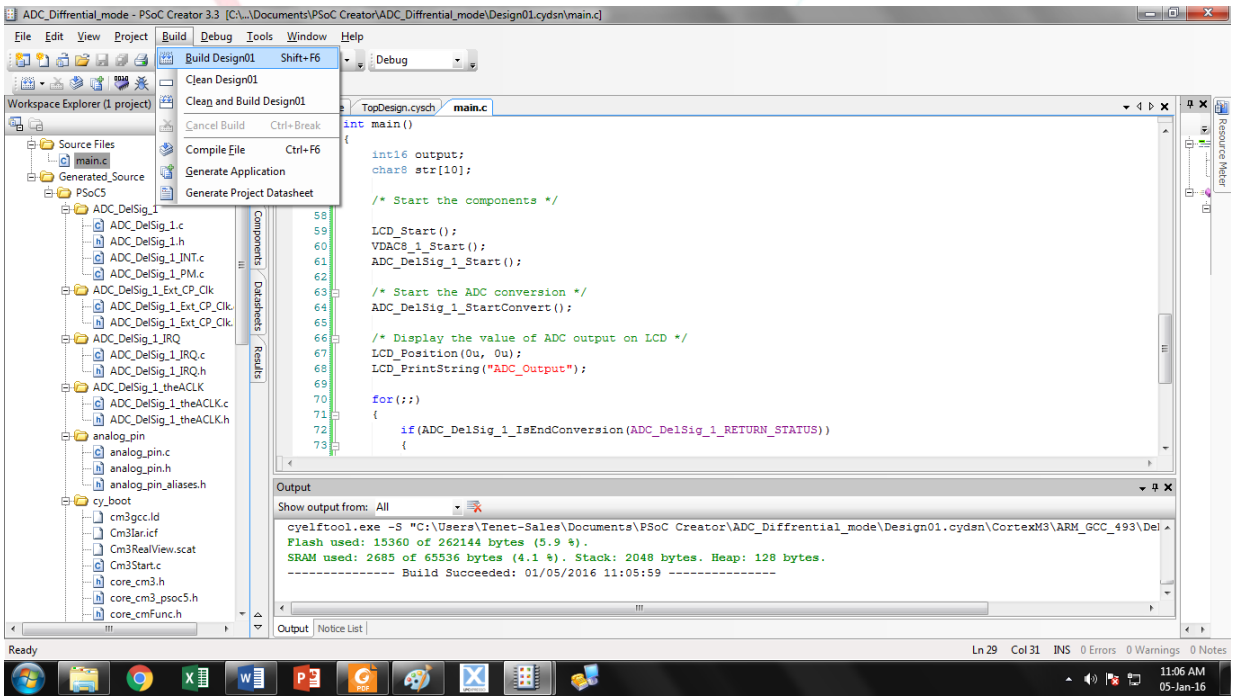

Figure 5

CODE:

```
#include <project.h>
#include <stdio.h>

#if defined (__GNUC__)
    /* Add an explicit reference to the floating point printf library */
    /* to allow the usage of floating point conversion specifiers. */
    /* This is not linked in by default with the newlib-nano library. */
    asm (".global _printf_float");
#endif

int main()
{
    int16 output;
    char8 str[10];

    /* Start the components */
    LCD_Start();
    VDAC8_1_Start();
    ADC_DelSig_1_Start();

    /* Start the ADC conversion */
    ADC_DelSig_1_StartConvert();

    /* Display the value of ADC output on LCD */
    LCD_Position(0u, 0u);
    LCD_PrintString("ADC_Output");

    for(;;)
    {
        if(ADC_DelSig_1_IsEndConversion(ADC_DelSig_1_RETURN_STATUS))
        {
            output = ADC_DelSig_1_GetResult16();
            output = ADC_DelSig_1_CountsTo_mVolts(output) ;
            sprintf(str, "%d mV", output);

            LCD_Position(1u, 0u);
            LCD_PrintString("          ");
            LCD_Position(1u, 0u);
            LCD_PrintString(str);
            CyDelay(100u);
        }
    }
}
```

Step 10: Finally, double click on Design01.cydwr and assign pins to desired port and build it.

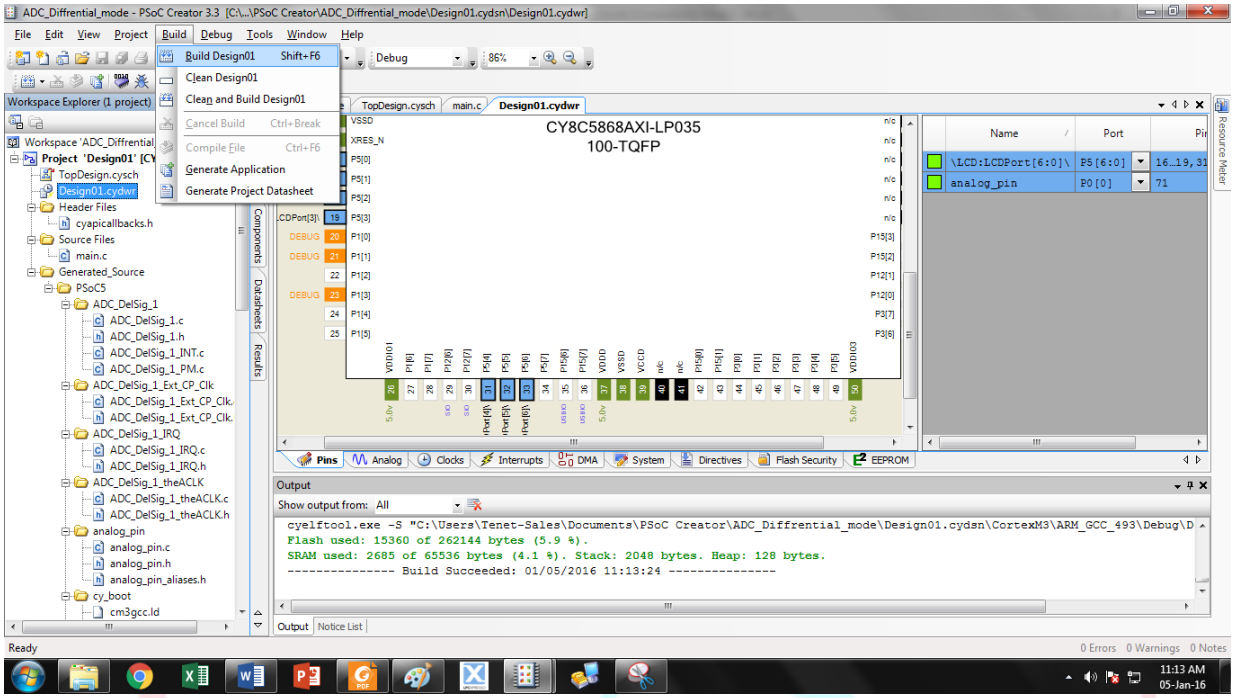

Figure 10

Step 11: If all goes well, go to Debug and click on Program.

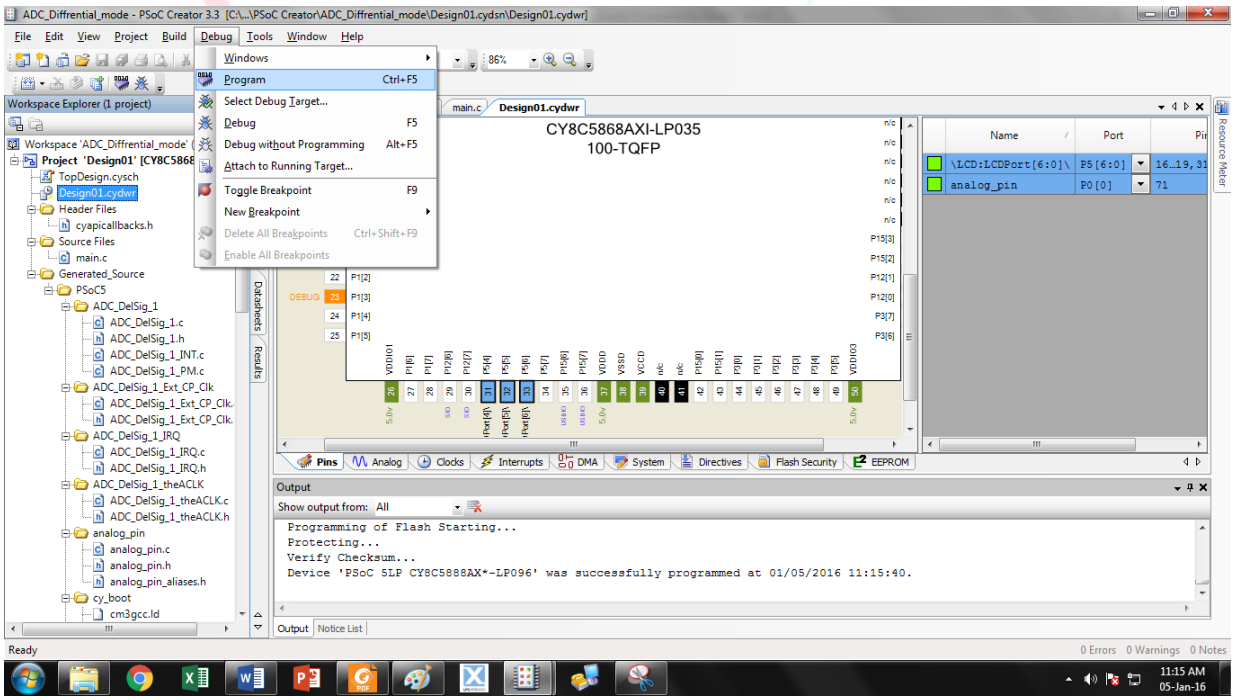

Figure 11

LCD PINOUT:

Interfacing Character LCD with FreeSoC2

LCD pin out	FreeSoC2 Pin
1 – VSS (GND)	GND
2 – VDD (+ve)	5V
3 – VE (contrast voltage)	GND
4 – Register Select	P5.5
5 – Read/Write	P5.6
6 - Enable	P5.4
7 – Data 0	Left Open
8 – Data 1	Left Open
9 – Data 2	Left Open
10 – Data 3	Left Open

11 – Data 4	P5.0
12 – Data 5	P5.1
13 – Data 6	P5.2
14 – Data 7	P5.3
15 – Backlight Anode	5V
16 – Backlight Cathode	GND

Table 1

Note: Connect potentiometer and LED to P0.0 to write/read analog values. By varying potentiometer, the intensity of LED can be varied.

OUTPUT:

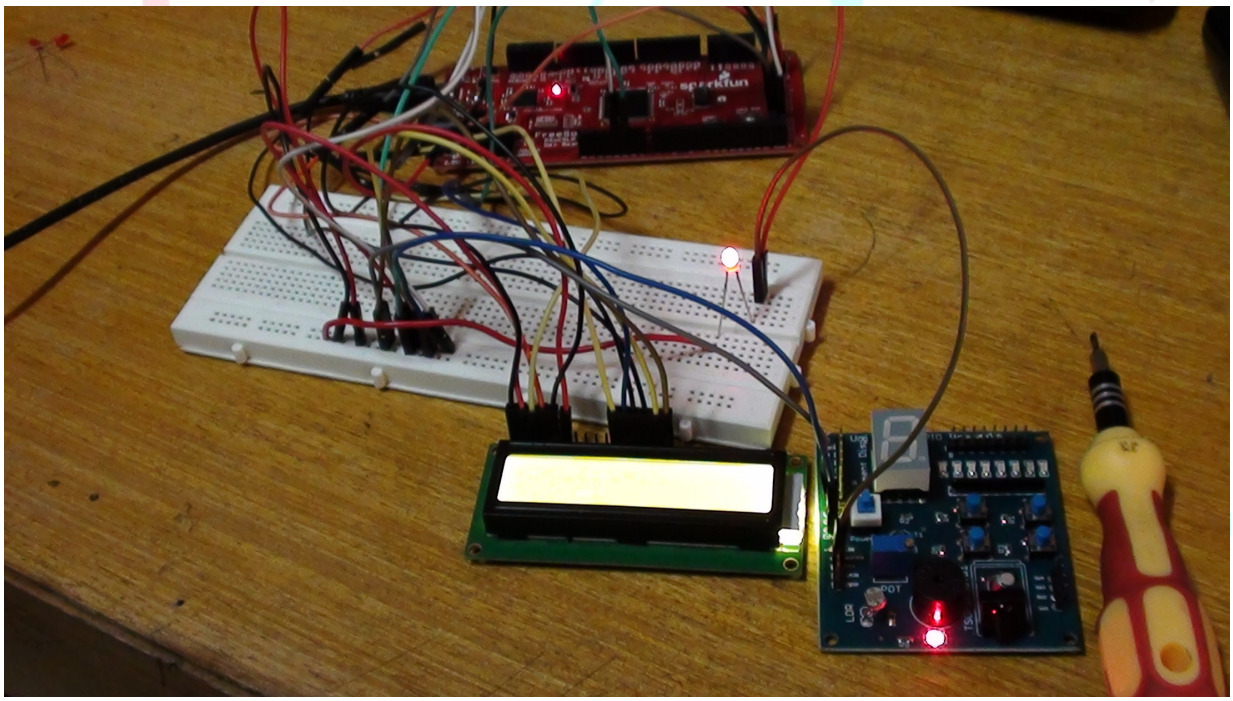

Figure 12

ADC output of 596 mV

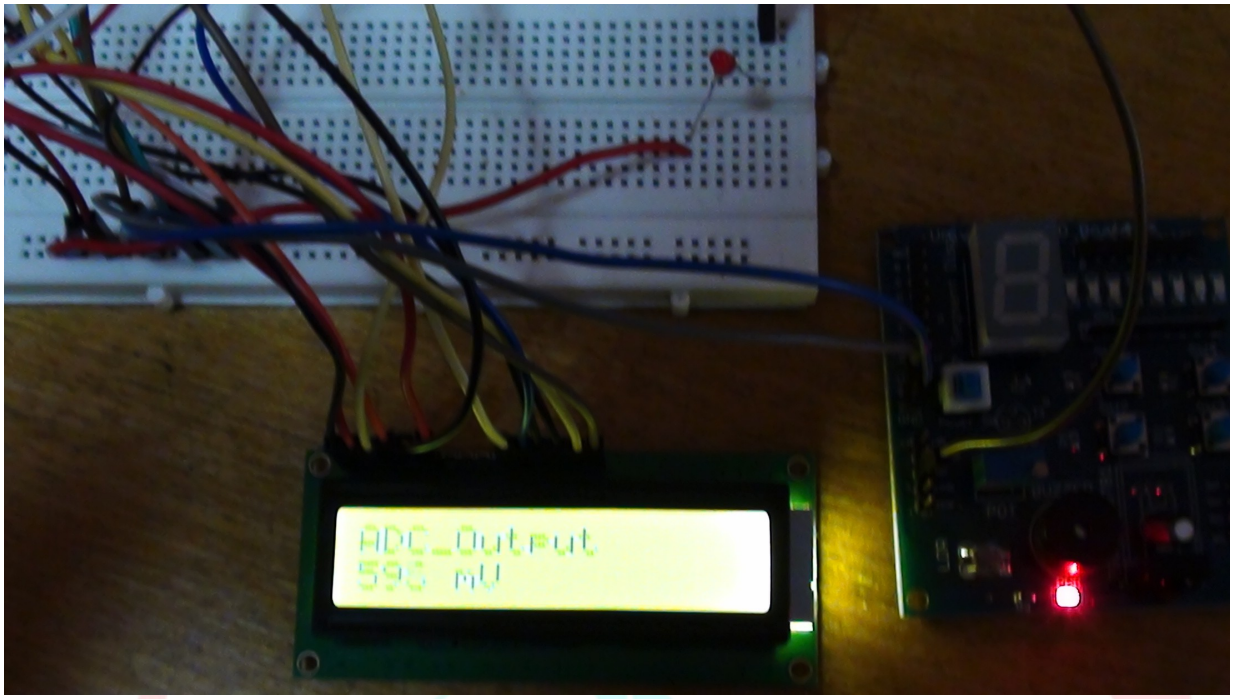

Figure 13

ADC output of 705 mV (0.7 V)

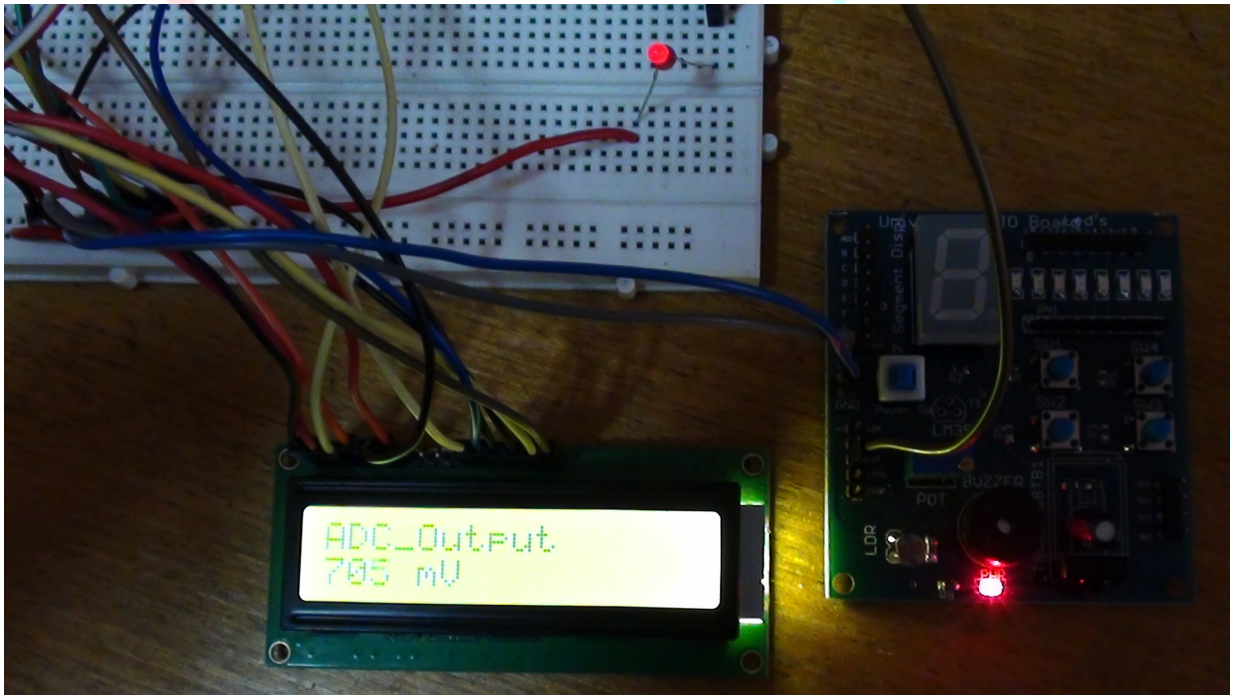

Figure 14

ADC output of 1000 mV (1.0 V)

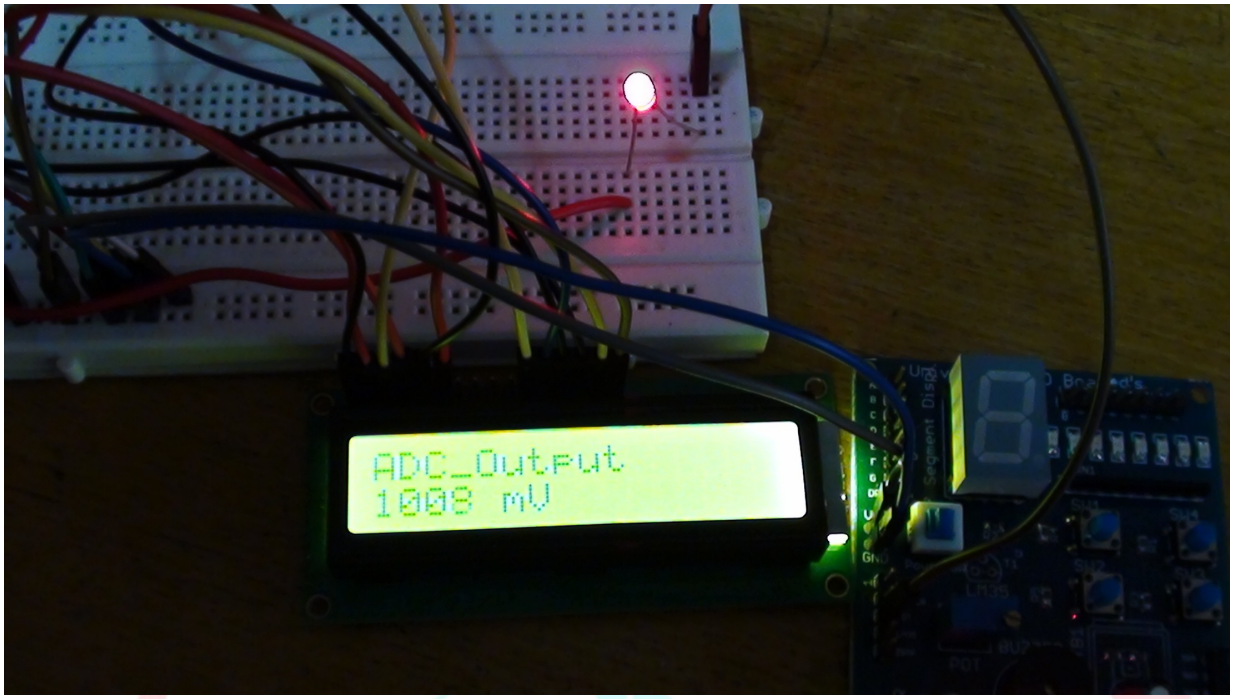

Figure 15

For product link:

1. **http://www.tenettech.com/product/7241/freesoc2-development-board-psoc5lp**
2. **http://tenettech.com/product/6655/universal-gpio-board**
3. **http://www.tenettech.com/product/2442/16-x-2-character-lcd-display-with-backlight-jhd162a-green**

For more information please visit: www.tenettech.com

For technical query please send an e-mail: info@tenettech.com